JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. · OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXV., No. 2655.] TUESDAY, MARCH 31, 1914. [66TH YEAR.

EDITORIAL NOTES.

Liability for Accident during Delayed Reinstatement.

IF, under the Metropolis Management Act, a local authority elect to carry out the reinstatement of pavements after gas-pipe laying, and there is procrastination on their part in doing so subsequent to the requisite formal notice being given by the gas company of the completion of their operations, who, in the event of an accident happening (between the notice by the company and the reinstatement) through the surface becoming uneven, is liable for damages—the local authority or the company? This is an issue that His Honour Judge Smyly, K.C., has, at the Bow County Court, been called upon to decide in an action for damages instituted, against the Commercial Gas Company, by a man and woman who suffered injury through tripping over a temporarily laid paving-stone, which had become uneven. The Judge has held that until the local authority (although the necessary notice had been given by the Company) take in hand the work of reinstatement, the liability for any damage occasioned rests upon the Company who caused the defect upon the surface. This raises a point of considerable importance to all statutory users of the subsoil of public thoroughfares; and we are glad that, in the general interests, the Commercial Gas Company are going to appeal against the decision of the County Court Judge. The amounts in dispute are comparatively insignificant—only £35 and £30; but the point is of the highest importance, as much more serious consequences might arise under similar circumstances through delay in restoring to a sound condition the paving in a public thoroughfare.

The Commercial Gas Company, it is clear, did everything reasonable in the circumstances so as to prevent trouble. The section of the work on which the accident occurred was commenced on July 26; and the pavement was temporarily replaced on July 28—notice being immediately sent to the local authority that the pavement was ready for reinstatement. The accident did not happen until the evening of Aug. 5—*i.e.*, eight days after the work had been completed by the Company, in which time a Sunday and Bank Holiday had broken into the normal working days. At any rate, five-and-a-half normal working days elapsed between the temporary replacing of the flags and the time of the accident. Meantime, the Company's men "kept an eye" on the paving-stones, and levelled those disturbed by the traffic and the settling of the subsoil. This act, *primâ facie*, seems to establish an acknowledgment of responsibility on the part of the Company pending the arrival of the local authority's men to permanently replace the paving; on the other hand, it is only what any semi-public body such as a gas company with any regard for the public safety would voluntarily do prior to the time of reinstatement—however tardy the local authority might be in performing their share of the work. The Company's action in this respect was a perfectly reasonable one, and certainly should not be to their prejudice in an action of this kind.

The question resolves itself into one as to what is a proper time within which the responsibility of a gas company under the circumstances should cease; and, now that the point has arisen, it seems that, if the appeal goes against the Company, some time-limit affecting responsibility should be applied after notice has been given to a local authority electing to do the work that the pavement is ready for reinstatement. If the County Court Judge's ruling is upheld in this instance, it follows that a local authority, under like circumstances, could protract indefinitely the reinstatement of a road or paving surface, and keep liability for any damages that might arise hanging over the Company who opened up the road. Gas and other companies using the subsoil of roads have to give statutorily prescribed notice of the opening up of the latter, and something in the nature of a time-limit should be applied at the other end of the work, to define when, in the event of the local authority undertaking surface reinstatement, the responsibility of the Company for the condition of the road or pavement should cease. It was only owing to the local authority preferring to exercise their right in this case that the Commercial Gas Company did not make the surface permanently good long before the date of the accident. The upholding of the County Court Judge's decision would place the users of the subsoil of roads in similar circumstances in a monstrously unfair position.

A Departmental Committee on the Smoke Evil.

THE gas industry will, we hope, very shortly have a fine opportunity for publicly showing what it has done, and what it can still do, in the way of producing greater purity of the atmosphere of urban districts. There have been quite enough popular data, more or less calculated on experimental bases, scattered about as to, for example, the weight and volume of the soot that is distributed in the atmosphere through the crude processes of solid fuel combustion in industrial and domestic heating; and now something more substantial and to the point of active and positive remedy is required. Such data as those referred to have indubitably had their use in arousing interest in the general subject; and such data will have useful effect in the help rendered thereby to any serious attempt to compulsorily produce better conditions—compulsorily so far as industry is concerned, and by the forces of example and education so far as home life is concerned. Everybody who has studied the matter agrees as to the evil of discharging into the atmosphere smoke from the combustion of coal—not only in regard to health, but general cleanliness; and, in all ways, the fouling of the atmosphere by this means is admitted to be a disastrous proceeding to the general economy. Everyone who has ever studied the matter also agrees that the Public Health Act, 1875, is a deficient instrument for producing any radical improvement; and Bradford, by its 1910 Act, which simplified for the borough the matter of prosecution for offence, and gave power to inflict deterrent fines, has shown that compulsion through public exposure and fines is a method that, among owners of works with chimney shafts, has a very salutary effect. It would not, however, be right to stiffen legislation to modify or prevent the smoke nuisance unless it could be shown that practicable methods exist of obtaining heat for all purposes which do not occasion trouble. There are such methods—methods using gas and coke which have been greatly improved of late; and so there is to-day less excuse than ever before for continuing a nuisance of the kind. As a matter of fact, as Lord Curzon bears witness, from his experience in Calcutta and Bombay, factory owners who abate their contribution to the smoke nuisance find themselves fully recouped by the savings in fuel for the improvement made in their heating arrangements. Manufacturers, however, who have been brought up in the old and barbarous ways of heating, and who stick to them, cannot, and some will not attempt to, realize that thermal and other value is escaping in the smoke that is issuing into the atmosphere above the coping-stones of their chimney-shafts. But they do realize it, when compulsion steps in, and causes a change in operation.

In the House of Lords last Tuesday, Lord Newton introduced a Smoke Abatement Bill; but he withdrew it on an intimation, given by Viscount Allendale, that the President of the Local Government Board, who is in the heartiest sympathy with the objects sought to be achieved, is now going to appoint a Departmental Committee to examine the present state of the law as affecting the matter of air pollution, the administration of the law, and to make proposals, in due course, for the consideration of Parliament. That is very satisfactory intelligence for us all. In view of what the gas industry has done, and can economically do, and the importance of the matter to the whole industry, it should be the business of the various institutions connected with it to

appeal to the President of the Local Government Board for the direct representation of its interests upon the Committee. There is no industry that can do more than that of gas supply to apply remedial or palliating measures to the evil suffered by the communities of our cities and towns through the combustion of raw solid fuel. The second step will be to prepare evidence to lay before the Committee—evidence which in its comprehensiveness, composition, and actuality shall command the attention both of the Committee and of the public.

Of all the organizations connected with the gas industry, the British Commercial Gas Association is the one that could best undertake complete statistical compilation as to what is being done in promoting atmospheric sanitation through converting the domestic and industrial heating customs of the country by the aid of the gaseous fuel and the smokeless solid fuel produced by the operations of the industry; seeing that the Association includes in its membership both company and municipal supply undertakings and the manufacturers of gas-using appliances. The Departmental Committee has not yet been appointed. It is promised; and it will therefore be an excellent thing not to leave until the event the collection and preparation of evidence to submit to the Committee. It will be a big, but not by co-operation an insuperable, job to accumulate the evidence that is available. Something more than generalities will be needed by the Committee to show them that stronger compulsion can be inflicted upon manufacturers without causing injury to their interests, and also to prove to them the advantage of giving local authorities powers to exercise "peaceful per-"suasion" among the occupiers of dwelling-houses in cities and towns through educational work as to the advantages—in comfort, in labour-saving, in domestic cleanliness, and in general economy—of the gaseous and coke methods of heating. Any complete evidence of a statistical kind bearing upon what the industry has done towards bringing about an improvement in the atmospherical conditions by the displacement of solid raw fuel for domestic and industrial purposes will supply good material for the general newspapers of the country to talk about. This is a publicity and business development matter; and so we think that it very properly comes within the province of the British Commercial Gas Association.

Elaborate Illumination Predeterminations.

The study of the science of illumination is a very fascinating one; but we do not want to see it carried for practical purposes into the realms of too academical precision. Up to a point, the study is interesting and valuable; but to submit to predeterminations the question of the illumination of every apartment in a large building, by amassing the divergent factors that go to make up the considerations affecting the matter, and to construct formulæ and curves (in which the polar curve of the unit of light, reflection, loss, and all sorts of things come in as elements)—well, we do not for a single moment think all this is essential. It is not the same thing as the construction of a building which is to be subjected to all kinds of stresses, and which for safety and economy demands that absolute calculation should be made in determining the character of the design.

Professor W. C. Clinton, B.Sc., of University College, submitted quite a learned paper to the Illuminating Engineering Society a fortnight ago, on the subject of calculated and observed values of illumination; and, in the communication, the very proper and exact work of the professor in engineering has been transferred to the subject of illumination. The paper was a clever one; it was suggestive; too much in praise of it cannot be said. But to what end all this work? The paper was making a very big matter of something that should in most cases be a very simple one. The thing that fastens on to one most in reading the paper is the very elaborateness of the methods by which Professor Clinton proves that, by the processes adopted, he has (taking polar curves of the units of light, and certain factors and coefficients) in specific cases by calculation predetermined, within quite a small percentage, what would, or rather did, happen in the way of illumination, expressed in terms of foot-candles, upon equipment with certain units under prescribed conditions. But there is nothing constant upon which to work, excepting—and that only approximately—the polar curve of the units of light. In every case, the character of the neighbouring surfaces in respect of colour and texture has to be taken into account to ascertain the amount of light that will be reflected, the conditions (such as windows) which allow of the escape of light, the size of the rooms which play a part, according to their closeness or distance from the units of light, in turning back or allowing a full distribution of the flux of light. Thus every case must be very carefully and minutely studied in order to permit any predetermination that will give such concurrence with observation as is shown by Professor Clinton.

There are simpler and more practical ways and means of arriving at a required effect in illumination than by all this laborious elaboration. There is no need for such fine exactitude, which, by depreciation of some of the very factors that are taken into account, is progressively departed from in time. Walls, paper, paint do not retain their pristine cleanliness and reflecting power. The sources of light themselves may be affected with time. An incandescent gas-lamp, by occasional replacement of an inexpensive mantle, and cleaning of glassware, can be maintained as constant as anything can be as a source of light; and, were it not for the painful and frequent fits of the jumps from which arc lamps suffer, the same might be said of them. But, in an aside from his paper, Professor Clinton definitely stated that, with some metallic filament lamps with which he had experimented, "ageing" had set in by the end of 24 days. Besides the diminution of light value in use with such lamps, there is the variation due to inconstant voltages; and time after time experimenters have shown that these lamps are not what, by their inscribed ratings, they profess to be. However, our view is that it is very rarely that such elaborate pre-calculation work as that to which Professor Clinton introduces us is necessary. The lighting engineer, who has studied the necessities of a building—who takes into account generally the environment supplied by walls, ceiling, or roof, and windows, and then the purpose for which light is required, and who considers also the question of eye protection—can (knowing his sources of light and their polar curves), by the exercise of care, discriminate as to all requirements in the matter of units and spacing.

If the subject is ever extended beyond the commonsense limits, and expert advice is bound up with elaboration and undue expense, then the profession of illuminating engineering will languish for want of employment, and there will be a set-back to what we fully appreciate as the good work that has been done by the Illuminating Engineering Society up to the present in expanding knowledge of illumination, even if the Society has not succeeded in finding how to produce the impartial illuminating engineer—impartial in that he is not the slave of any one form of illuminant.

Retort-House Reconstruction.

When retort-house equipment is of archaic type, although for old practice working comfortably and doing well, there may be in these days a good financial gain in removing the plant, and substituting for it a more expensive modern type. There have been many descriptive illustrations of this in our columns; but perhaps never one more convincing than that which appears this week through the paper read by Mr. Frank J. Pearce before the Southern Juniors on Friday last. The *locus in quo* of the piece of reconstruction work described was the Mill Hill works of the North Middlesex Gas Company. The results that are being obtained from the new installation show that it was, from the economic standpoint, full time the equipment of the old house was discarded, and its place occupied by plant of greater efficiency, although, be it said, that under the Engineer of the Company (Mr. Lawrie Trewby), the old settings—direct-fired, shovel-charged, and working six-hour 5 cwt. charges—were not doing badly in the make of gas per ton (11,700 cubic feet). Even in this regard, however, there was a loss; and in every other respect that contributes to good carbonizing practice, there was also a loss, taking the results obtained from the new plant as the standard of working for to-day. The gains are so material and so indisputable, that they are worth special mention. The new equipment occupies the same house, which has had its roof raised. But in it there are 90 through retorts (20-feet), compared with 63 in the old house; and the furnaces are on the regenerative system. The retorts are 3 inches larger in cross-section. The six-hour working has now been changed to eight-hour; and the 5 cwt. charges to 10½ cwt. ones. The productive capacity of the old plant was 770,000 cubic feet, which compares with, on the same ground area, 1,800,000 cubic feet with the new plant. The make per ton with the new settings averages

14,000 cubic feet—an increase on the make of the old plant of 2300 cubic feet, using practically the same coal. The production of gas per man employed was, under the old system, 27,500 cubic feet per day; while under the new system it is 67,000 cubic feet, with an anticipation that, when the whole installation is at work, the make will be 100,000 to 120,000 cubic feet per man. The fuel account has descended from 15·5 lbs. to 10·1 lbs. of coke per 100 lbs. of coal carbonized. Coal-handling plant has now been applied; and the Fiddes-Aldridge machine is used. For coke transport an electric telpher plant is in operation.

These figures tell of a greater make of gas per ton of coal carbonized, much lower labour costs, and reduced fuel expenses, and therefore a greater profit per ton of coal carbonized; against which has to be placed the extra capital charges, about which (as in the case of exact working costs) no mention is made in the paper. But it is quite easy to see that the greater economy and efficiency of working will leave a good balance after meeting the additional capital charges. It is remarked that, under the new working, there is a small percentage falling off in the calorific power of the gas compared with the old working. But gas of an average of 539 B.Th.U. gross has a good margin before it reaches the penal line of modern enactment in regard to the calorific value of gas. And, moreover, the B.Th.U. obtained in the shape of gas total to nearly 7,546,000, against 6,610,500, per ton of coal carbonized—a gain not much short of 1 million B.Th.U. But concerning illuminating power, under the old working, and the No. 2 burner, it was 13·72 candles, while under the new working it is 13·17 candles—a drop of 0·55 candle, with the gain of 2300 cubic feet per ton of coal carbonized. Seeing that the Company have to work to a standard of 15 candles, this shows that the carburetted water-gas plant has to be used for enrichment purposes; and in view of the times of high prices for oil, this is rather interesting, and would supply instructive material for a little balance-sheet showing what would have been the gains and losses, in contrast with actual working, by making a somewhat lower quantity of gas of higher illuminating quality per ton of coal, and carburetted water gas of a less rich quality. Mr. Pearce raises the point as to the smallness of the loss of candle power in view of the larger make; but he does not in the paper offer any explanation as to the cause, nor does he describe the coal used, beyond giving satisfaction that, under the present system, it is practically the same as under the old. We should imagine that the principal explanation is that, with the 10½ cwt. charges, the gas is not exposed to the same amount of free heated space in the retort as when only 5 cwt. charges were employed. As a matter of fact, however, the illuminating value realized per ton of coal is much greater with the higher make than with the lower, though showing the slight depreciation per 5 cubic feet of gas in the No. 2 burner.

These are points which prove the value of the change that has been made in the carbonizing operations of the Company. A fair amount of attention has lately been devoted to the hydraulic main and its working; and to the effect that proper operation has upon ammonia recovery, and other points. In this installation, Mr. Trewby has adopted a system which consistently relieves the main of heavy tar. Also, by running the retort-house liquor into a tank, then pumping it into an elevated tank, and circulating it in the hydraulic main before running off to the well storage, a considerable increase is obtained in the strength of the liquor; and this has the collateral and important advantage of not permitting a stream of hot weak liquor to flow into the well, which would reduce the value of the bulk of the liquor, as well as, by increasing the temperature, contribute to the causes of ammonia loss. This is all obviated by the system worked by Mr. Trewby in his new installation. In regard to dealing with the coke by means of the telpher plant, it is observed that the incandescent coke is first partially quenched in the retort-house by means of water from a hose-pipe, and then with the skip is immersed in a tank of water to complete the quenching. This is a system that has been found very detrimental with the coke from some coals. We cannot see how any coke can avoid being extensively fissured by such treatment, and containing, after it, an undue percentage of moisture. Mr. Edward Allen and one of his Liverpool assistants devised a means some time since for partly overcoming the ill-effects of this drastic treatment of the hot coke under telpher conditions; but we have not heard the results of the use of the method they patented. There is one other point. It is observed that every alternate buckstay on the discharging side of the new bench has been lengthened, and forms the support for one end of the cross joist carrying the telpher track. With a moving telpher on the track, and on its outgoing journey carrying a skip containing a couple of discharges of coke, is it not likely there will be vibration and strain thrown on the bench buckstays on the one side, which will be a disadvantage to the stability of the brickwork of the bench?

The paper is an interesting one; and it illustrates well the progress in one department of gas-works engineering, and in the higher efficiency and economy of modern carbonizing methods. The North Middlesex Gas Company will shortly reap the full benefit of the economy and efficiency which have been made possible through the thoroughly up-to-date work of their Engineer.

Gas Men and Electricity.

The members of the Yorkshire Junior Gas Association on Saturday had before them a paper by Mr. S. Barker Johnson, of Hull, in which a sketch was given of the fundamental laws of electricity, and of the working of an electricity generating plant. The constituent parts of the plant and their purposes were individually examined, as well as the inherent weaknesses of many of those parts—particularly of electric motors. Those who have been trained or have studied electricity generation and use will say that the paper was of a somewhat elementary kind, and that much of what was said is already available in the text-books. This fact has induced us to considerably curtail the paper; but, in doing this, we should not like it to detract in any way from the objects that the author had in submitting the paper to the Association, which were to arouse interest in the subject among the junior gas men, and to induce consideration of several of the points made. There is no question about it that gas men will have to devote more attention than hitherto to the technics of electricity generation and application. Several gas undertakings have now generating plants for providing energy for propelling and otherwise operating their machinery; several undertakings are responsible for the supply of the primary movers in connection with private electricity generating sets; and quite a number of gas undertakings now have general electricity supply powers. It is imperatively necessary therefore that the younger school of gas engineers should be well versed in such plant; and for the matter of that, so should the members of the older school, who are responsible for the good conduct and safety of any electricity plant incorporated in their works. We are afraid that close observation would not convince that all chief gas engineers with electricity plants under their care had troubled to master their intricacies, but, on the contrary, would show that they have largely left this part of modern plant development to the juniors, and so themselves are not particularly well qualified to judge the conditions of the plant, and whether or not the best possible is being obtained from it. It is a pity where this is the case; but happily it is not so in all instances of installation.

Being descriptive, and not controversial, there is not much room given by the paper for comment—variation in practice and experience, however, should supply scope for the consideration of many matters dealt with in the paper. Towards the end, Mr. Johnson furnishes some information as to the weaknesses of, and therefore the seats of failure in, electrical plant and machinery. It is useful for gas engineers to know of these matters, whether they are responsible for generating machinery or the running of electric motors; the information may be useful in commercial competition. This, however, is not the intention of the author. His only purpose in referring to the matter of inherent weaknesses is to indicate where to look for, and where to guard against, trouble. But it is a little singular that the paper should have concluded on those lines of failure and trouble, seeing that, in an introductory paragraph, the author says it is "neither good manners nor good sense to speak "in a depreciatory way of a rival," and that "neither "branch stands to gain by a condemnation of the other." The admonition and counsel would be excellent were we all—gas and electrical competitors alike—possessed of, and could deliberately put into practice, the same ideals in this connection as Mr. Johnson. But as we are not all so possessed, as this is a competitive age, and as there is a good deal of human nature imported into business competition, we are afraid that trading gains will continue to be sought to be effected by praising up one's own commodity

and pointing to the weak points of the rival. If the men of the gas industry abstained from that very natural mode in commercial competition, the electrical industry would make good use of the silence for effecting gain. It has been one of the hardest tasks of recent strenuous years to keep pace with the traducers of gas; and for the gas industry to stubbornly remain dumb while being slandered on all sides would be not only foolish but suicidal. Does Mr. Johnson think the public would not conclude from the silence that the gas industry had a bad case? What, too, if Mr. Johnson's rigorous abstention from criticizing a commercial rival were followed, would the gas salesman do when catechized by a householder, shopkeeper, or manufacturer as to the relative disadvantages and advantages of the competitors? The information that he politely but firmly refused to impart would not be the information that the electricity salesman would impart—if not openly, *sub rosa*. We will go with Mr. Johnson to the extent of saying that there is nothing to be gained by false representation, and that we do strongly deprecate.

No Coke Stock, and other Points.

How many gas undertakings, after the unusual experiences of last year, when coke stocks increased so considerably, can report (now that, according to the calendar, spring has set in) a yard absolutely clear of coke stock? There is one gas engineer in Yorkshire who can claim to be in this happy position. He apparently trades on quality, and knows that in his case quality pays. The coke he supplies is described as dry, porous, and well-screened; and for coke of this stamp, the undertaking are obtaining a price that many other undertakings would be highly delighted to realize. All that was made by this one concern last year was sold; and there is no stock in the yard beyond what is required for contracts. That is a healthy state. The question of the supply of dry coke is one that was recently raised in Mr. Thomas Glover's presidential address to the Southern Association; and it is one that managers generally should look into. We have heard of more than one old contract lately that has been lost through the purchaser finding out that he can get a drier coke elsewhere. We hear, too, strong complaints by some small undertakings of larger concerns undercutting them, by selling coke in their areas at a much lower price delivered than they are getting for their own local deliveries, and so spoiling the market for the small concern, which can less afford the loss of custom. In one case, the victim of this sort of competition has retaliated by securing a good order in the district of the larger company, below their local price. But there is carriage to pay from and into the areas of the coke-competing concerns. This is where the folly of this sort of thing comes in—the railway company is the only one to benefit. If the price gets noised about at which the small concern is supplying the consumer in the area of the larger undertaking, the local coke market of the latter will have a shock that will not be beneficial to it. While mentioning this question, we also hear grave doubts cast on some of the coke returns made in these times to the Commercial Sections as to stocks, dealings, and prices. The time when the sections should be of the greatest value is the time when markets are in the worst position, and that is when there should be unblemished loyalty.

Gas v. Coke for Heating Bakers' Ovens.

The publication of the translation of the paper on the heating of bakers' ovens by gas which M. Rouland submitted to the members of the Société Technique du Gaz en France at their last meeting, taken in conjunction with the abstracts of the specifications of two recent French patents for effecting the object in question which appeared in the "JOURNAL" for the 10th inst. (p. 650), has directed the attention of all suppliers of gas to an additional outlet for their commodity. The subject is not a new one on the Continent. At the meeting of the above-named Society in Paris in 1910, it was introduced by M. Méker, who read a short paper describing the burner he had devised for heating bakers' ovens; and at the Brussels Exhibition in the same year there were to be seen in operation in the pavilion of the Belgian Gas Association two ovens designed and constructed at the Municipal Gas-Works, one of the Engineers at which (M. Bromham) explained their capabilities. In noticing the matter at the time, we expressed the opinion that the gas-heated bakers' oven should commend itself as an economical and cleanly appliance, especially in localities where the price of gas is lower than it is on the Continent, and where wood is dear. Notwithstanding the high price of gas in Paris (about 4s. 6½d. per 1000 cubic feet), no fewer than 37 additional bakeries adopted this fuel last year for heating their ovens, as the result of propaganda work carried out by the Gas Company. Reference to the subject here is prompted by the remarks of Professor F. A. Sinnatt, in the course of a lecture recently delivered by him to the Manchester Bakery Students' Society, some extracts from which are given in another part of the "JOURNAL." He discussed the relative values of gas and coke as fuel for the heating of bakers' ovens; and the conclusion he came to was that gas would in future play an important part in the bakeries of this country, just as it had done in the French capital. But it must be cheapened. With regard to coke, the complaint against it is that it contains too much water. This defect must be remedied. What is wanted is dry coke, broken into pieces of suitable size.

Coal Contracts.

The London Gas Companies have been engaged in making their contracts up North; and negotiations are still pending for considerable quantities. According to our Northern coal correspondent, the prices that are being fixed are equal to 11s. to 12s. per ton f.o.b., or 14s. 3d. to 14s. 10½d. per ton delivered. Including Port of London dues, we shall be surprised if the cost of the coal on to the works, with the lower freights prevailing, is not quite 2s. 6d. per ton lower than current contracts. Troubles in certain coal-fields have been magnified for all they are worth as causes for not expecting a reduction quite so large as 2s. 6d. per ton. Some time since, while not definitely counselling delay in making contracts by the smaller concerns, a hint was thrown out in these columns that there need be no hurry in the matter, for the reason that the quantity of coal purchased for the London gas-works must more or less set the prices for other gas undertakings. But already some of the smaller concerns are obtaining their coal for the coming year at half-a-crown less than prices under the contracts running out in the next three months; and there is no reason why this reduction should not be generally secured for coal of like quality to that supplied under the existing contracts. There are other concerns that have had quotations through their old contractors showing a reduction of only 2s. to 2s. 3d. for similar coals. Some have accepted these terms; but unless the old contracts were placed at a time when prices below ordinary last year's rates were obtainable, gas managements may be advised to extend their inquiries, as 2s. 6d. reduction has been, and can be, obtained. Quite a considerable number of companies are still holding-back from concluding their contracts, not being satisfied with the quotations already submitted for their consideration.

Extravagant Local Authorities.

An inquiry held at Exeter last week suggests that the Local Government Board are disposed to keep a much-needed watch over the expenditure of local authorities, in some directions at least. The matter arose out of an extension of the city boundaries last year, which led to the absorption of the urban district of Heavitree. In opposing the action of the City Council, Heavitree ran up so big a bill of costs that the District Auditor struck off no less than £2435; and the Local Government Board surcharged this sum upon the members of the late District Council. The inquiry was held as the result of an appeal by these gentlemen to be relieved of personal liability. Major Norton, who went down to hold the investigation, was the Inspector who conducted the original inquiry; so that he was no doubt speaking from personal knowledge when he referred to "the enormous and unnecessary expense" which had been incurred. One of the items to which exception was taken was that of the fees of counsel. In the opinion of the Local Government Board, or their Inspector, it was unnecessary to engage counsel at all, and certainly not necessary to have both senior and junior counsel. Then there were expert witnesses, accountants, sanitary engineers, and land agents, who were employed on the advice of counsel, but whose assistance the Inspector thought he might have dispensed with. Other charges which came under criticism were those made by the Council's own officials for getting up evidence to support the case. There seems little reason to doubt that, as the result of the in-

quiry, a considerable sum will have to come off the bill which the District Council ran up; and some of those who were responsible for incurring the expense may still be saddled with an unpleasant personal liability. Such an object-lesson might do good. Municipal expenditure, like national expenditure, is always on the upgrade; and anything which will tend to check it will be welcome. Experience shows that the ratepayers are practically powerless, because of the difficulty of getting them to act together; while the Local Government Board can only in exceptional cases intervene in the interests of economy. Unfortunately, as in this instance, they usually only come in when the mischief is done and the money is spent.

Daylight Saving and Gas Consumption.

The composite deputation of municipal authorities, scientists, and others who waited upon the Home Secretary last week to urge the Government to take up the Daylight Saving Bill met with much sympathy from Mr. M'Kenna, but a positive declaration that the Goverment could not take charge of the measure, until public opinion had matured to a larger extent than it has done in favour of a change. In view of this, the right honourable gentleman suggested that the only hope for the measure was to get members to ballot for it, and secure it an early second reading as a Private Members' Bill. Much good that would do; and Mr. Willett, the protagonist of the daylight movement, knows this, and is consequently much disappointed. During the interview, Sir Henry Norman quoted the opinion of Mr. Wilson Mappin, the Chairman of the Sheffield Gas Company (who is in favour of the Bill) that the Bill, if passed, would save the population of Sheffield £12,000 a year in gas. If this were so, he added, the annual saving to the whole country in gas would be £1,200,000. We rather fancy these figures are wide of the mark. What Mr. Wilson said was that, it was calculated that a saving of 80 million cubic feet would be effected if the Bill became law; and if we remember rightly, the proposal is only to advance the hands of the clock during the six long daylight months of the year. The 80 million cubic feet saving would therefore only apply to one six-month period. As the saving would affect the ordinary gas consumers more than any other class, and 1s. 3d. per 1000 is the top price to ordinary consumers, this would only represent £5000 a year loss to the Company, and not £12,000. It is impossible to say what the saving to gas consumers would be throughout the whole country, because of the considerable consumption for cooking and water-heating in the six light summer months, in addition to industrial use, and street lighting, together with the variation of the incidence of consumption through disuniform local conditions and the difference in the charges for gas. As a matter of fact, only the lighting consumption in summer would be partially affected. If, therefore, Sir Henry Norman based his figures on the Sheffield calculation, which, as quoted by him, was wrong, then the computation of the annual saving in expenditure for gas to the whole country is very far from the truth.

Manchester Junior Gas Association.—It is desired that special notice should be taken of the fact that the annual meeting of the Manchester and District Junior Gas Association will be held next Saturday at the Grosvenor Hotel, Deansgate, Manchester (not at the Exchange Hotel, the usual place).

Management of the Stoke Corporation's Gas-Works.—We learn from the "Staffordshire Sentinel" that the death of Mr. Edward Jones, the Manager of the Stoke-upon-Trent Corporation's Burslem Gas-Works, will result in the gas management undergoing some amalgamation and rearrangement—Mr. Langford probably becoming responsible for the Longton and Fenton works, and Mr. R. Surtees, the Manager at Fenton, possibly being permanently transferred to Burslem. Meanwhile, the temporary arrangements which were made in consequence of Mr. Jones's illness in January are being continued until May.

Mrs. Cloudesley Brereton on Domestic Lighting, Heating, and Cooking Problems.—At the meeting of the Institute of Sanitary Engineers at Caxton Hall, Westminster, to-morrow evening, Mrs. Cloudesley Brereton will read a paper on "Problems of Domestic Lighting, Heating, and Cooking, from the Women's Point of View," with special reference to the basement house. The problems in question will be considered from the standpoint of the householder, especially the mistress of the house and her servants, the sanitarian (including sanitary engineers, architects, builders, &c.), the property owner and his advisers, and the legislator, whose interest is greatly needed in the case of the houses which are rapidly becoming unwholesome tenement dwellings. Mr. A. J. Martin, a Past-President of the Institute, will preside; and the paper will be followed by a discussion.

OBITUARY.

We have to record the death last Tuesday at Southport, in his 71st year, of Mr. JOHN J. HOLDEN, who was one of the oldest members of the Manchester Royal Exchange. He was Chairman of Messrs. Hardman and Holden, Limited (chemical manufacturers), and of the Manchester Oxide Company, Limited. He was also a Director of Messrs Mather and Platt, Limited.

A cablegram has been received at Cheltenham announcing the death at Luxor, Egypt, of Alderman JAMES B. WINTERBOTHAM, who had left England for the benefit of his health. He was a member of a well-known local family, and practised as a solicitor in the town. Among the numerous positions he held was a directorship of the Cheltenham Gas Company; and it may be remembered that, in the report given in the "JOURNAL" of the inauguration some weeks ago of the Company's new works, mention was made of the fact that Mr. Winterbotham was abroad, and so was compelled to miss the pleasures of the day.

Great regret is felt in Belfast at the death, last Wednesday, from heart failure, of Mr. R. J. M'MORDIE, M.P., Lord Mayor of the city. He had been abroad on holiday, and only returned home on the Tuesday morning. At that time he was slightly indisposed; but later the illness developed into acute bronchitis and pneumonia—heart failure supervening the following afternoon. Mr. M'Mordie, who was in his 66th year, retired from practice as a solicitor in 1899. Though it is only seven years since first he entered the Corporation, he was elected Lord Mayor in 1910; and this office he was chosen to hold for five years in succession. Mr. M'Mordie was at all times during his municipal career deeply interested in the gas undertaking. In the improvements introduced last year, and in the extension scheme which the Gas Committee now have in hand, he manifested the utmost concern; and it may be recalled that he showed great friendliness to the Irish Gas Managers' Association, and to visiting experts and deputations from England and Scotland. He was an ex-officio member of the Belfast City and District Water Commissioners.

PERSONAL.

Mr. A. CRAIG has been appointed Manager of the Kilwinning Gas-Works in succession to his father.

Mr. R. HESKETH JONES having resigned his seat on the Board of the Bournemouth Gas and Water Company for reasons of health, the Directors have elected Sir CHARLES JAMES JESSEL, Bart., to fill the vacancy.

Alderman Hart having declined to be elected Chairman of the Canterbury Gas and Water Company for the ensuing year, owing to indifferent health, the Directors have unanimously appointed Mr. SILAS WILLIAMSON, the Vice-Chairman for the past three years, and a Director for fourteen years. Mr. JOHN GREASLEY, who has been many years a Director, has been unanimously elected Vice-Chairman, in place of Mr. Williamson.

Mr. FRANK BOARDMAN, who is leaving the South Suburban Gas Company to take up the position of Assistant Engineer to the Cardiff Gas Company, was last Thursday the recipient of a testimonial and the expression of the good wishes of his colleagues. Mr. S. Y. Shoubridge, the Chief Engineer, in making the presentation, voiced the esteem and regard in which Mr. Boardman is held, and heartily congratulated him upon his promotion, wishing him every success and continued good health and happiness in his new sphere. In asking Mr. Boardman to accept, as a token of his regard, a gold watch (suitably engraved), a pipe, and a silver match-box, Mr. Shoubridge said he trusted that, as the watch would be worn near his heart, so he would be reminded of the friendships formed in the South Suburban district, the match-box would induce him to strike new friendships, and the pipe to "smoke the pipe of peace." Mr. W. G. Waller (an Employee Director), Mr. J. W. Whimster, Mr. W. M. Judd, and Mr. C. M. Bacon also spoke in feeling terms; and Mr. Boardman suitably responded. There was a good gathering of the employees; all departments being represented.

The appointment of Engineer and Manager of the West Bromwich Corporation Gas-Works has been secured by Mr. W. H. JOHNS, of Malvern. It is only about six months since Mr. Johns gave up his position as Resident Assistant-Engineer and Superintendent at the Saltley works of the Birmingham Corporation Gas Department to take up that of Gas and Electrical Engineer to the Malvern Urban District Council; and he is therefore to be congratulated upon a rapid rise to a more important post. Previous to his appointment to Saltley, Mr. Johns (who, it may be mentioned, is President of the Midland Junior Gas Association) was for some seven years under Mr. C. Stafford Ellery, as Engineering Assistant, at the Bath Gas-Works. Before that he gained much experience in constructional work during a similar period spent with West's Gas Improvement Company, Limited. At a special meeting of the West Bromwich Gas Committee on Monday of last week, seven applicants appeared for final selection for the position, the salary attached to which is £500 per annum; and the Committee unanimously decided in favour of Mr. Johns, who is 34 years of age. Since he has been at Malvern, he has had

the control of all matters in each department, including the commercial work; and during his short stay there, the working results have been such that the Committee recently resolved to reduce the price of gas by 2d. per 1000 cubic feet. The appointment will come up for confirmation at the West Bromwich Council meeting to-morrow.

On Monday evening of last week, a presentation by the staff was made to Mr. ERNEST ABLETT, Assistant Engineer to the Rotherham Corporation Gas Department, who is leaving to take up a position as Assistant to the Swansea Gas Company. Mr. J. S. Naylor, the Engineer and General Manager, said that during the ten years Mr. Ablett had been connected with the department he had always carried out his duties in a highly satisfactory manner. He was leaving them to take up duties at a larger works in Swansea; and he would not be long there before the Directors and Manager would recognize that in him they had a servant in whom they could place implicit trust. By his diligence and deep interest in his work, Mr. Ablett had made himself an efficient gas engineer; and he prophesied for him a very brilliant future. Mr. Naylor then handed to Mr. Ablett a handsome mahogany chiming clock, suitably inscribed. Mr. Ablett thanked the Manager and staff for their handsome present, for the way in which they had received him, and for the friendships which he had made while he had been in Rotherham. On another occasion, Mr. Ablett was given a smoking cabinet which had been subscribed for by the workmen. Mr. Naylor presided; and the presentation was made by Mr. John Bithery (the oldest employee). Mr. Ablett thanked them all heartily for their gift, as well as for the many kindnesses he had received at their hands. It may be mentioned that Mr. Ablett was educated at the Wakefield Grammar School, subsequently attending lectures at the Leeds University; and he holds first-class honours certificates in "Gas Engineering" and "Gas Supply," in addition to which he has many certificates in other technical subjects.

NOTES FROM WESTMINSTER.

WHILE last week great excitement prevailed throughout the country, and particularly in the chambers and corridors of the Houses of Parliament over the political situation, there was one part of the legislative pile that seemed to be altogether removed from the immediate outer troubles. In the Committee rooms, things pursued quite a placid course; and a very fair amount of work was got through during the five days constituting the parliamentary week. It is manifest that Committee work is being pushed forward as rapidly as possible, as no one knows what may be the nature of the next "bolt from the blue," or when a dissolution may result. Uncertainty broods over everything political; and, this being so, there is an evident inclination on the part of Committees to resent the tortoise-like rate at which the proceedings on some Bills are being conducted, and the trivial detail to which they are compelled to listen hour after hour, unless the chairman stems the flow by resolutely saying (as more than one chairman did last week) that they did not want to hear anything more on certain points. Chairmen are loth to do this, as they do not like to give the impression to any party that their case has not been sufficiently considered; but when cases are overdone, as have been some of the oppositions to Gas Bills this session, it is time that those responsible were smartly pulled up.

No intimation has yet been made as to the appointment of a Committee to consider the Gaslight and Coke Company's calorific value Bill; and so we may reckon upon the matter being deferred until after Easter. As each Gas Bill now comes along, the intimation is made that the calorific standard and test is to abide by the decision in the Gas Light case. The Private Bill Authorities seem anxious, according to a statement by Mr. Ernest Moon, K.C. (Speaker's Counsel), to arrive at something definite on the matter of the calorific value clauses as a result of this session's work; and, if this is the issue, then we may expect to see a model calorific value clause among the Model Clauses for the session 1915.

The most important Bills that were before Committees last week, and in which we are concerned, are noticed in the annexed paragraphs. But there are one or two general points associated with the Stone Gas and Electricity Bill which may be alluded to in these opening notes. The Bill has been before the Unopposed Bills Committee of the House of Lords—opposition having been withdrawn by agreement. The District Council arranged with the Company for the insertion of a purchase clause, operative in the session 1916 by giving six months' notice of intention to promote the necessary Purchase Bill. After the rebuff received by the Staffordshire County Council in the Kidsgrove case (as noted last week), that body seems to have been a little more amenable to reason in regard to their desire for special privileges and exemptions in connection with gas-pipes laid in main roads. The Council withdrew their opposition to the Stone Bill by a simple agreement regarding pipes over bridges. It provides that in the event of the Council desiring to alter the position of any of the Company's pipes over bridges, a month's notice is to be given to the Company, and the alteration is to be carried out at the expense of the Council. That is as things should be.

The London Association of Accountants have apparently given up their quest for a greater parliamentary recognition by appearing by Counsel before Committees. They had petitioned against the Southend Gas Bill, but were not present to support their petition when the Bill reached Mr. Mount's Committee.

Skegness Trivialities.

After being cuffed and kicked in a Police Court, at the Assizes, and in a Parliamentary Committee room, the District Council of Skegness might perhaps indulge in a little meditation, and ask whether they see themselves as other people see them in the matter of their relations towards the local Gas Company. When such widely separated tribunals as the Magistrates sitting at a Police Court and a Committee of the House of Lords give definite and unqualified verdicts against a public body, the members of that body who are intelligent ought to have no difficulty in arriving at the conclusion that to others there must appear to be more than a trace of rancour in their proceedings. But the District Council of Skegness are paying heavily for the indulgence of an aggressive spirit towards the Gas Company; and it is a big Bill they have been running up in Parliament, and to no valuable purpose. Two Bills with the name of Skegness upon them were promoted this session. The one was by the Gas Company; the other by the District Council. The Company made a perfectly clean breast of the fact that prior to Mr. J. H. Salmon becoming their Resident Manager and Mr. E. J. Brockway, their Consulting Engineer, the conduct of the Company and the results of the working were not all that they ought to have been. The Company themselves applied the remedial measures; but naturally time is required to set one's house in order, when disorder has reigned. And no one can deny that the Company have been on the right road during recent times, have made good progress to a better state of things, and their present Bill shows that they are desirous not only to obtain statutory powers, but to place themselves under statutory regulation which will have the effect of enabling them to work freely and well in the interests of the community. The Council and their legal representatives and witnesses would not recognize, or to a very slight extent, any of these things. The Council, through its Bill, were out for expropriation, and expropriation meant in their eyes the making the most of the past, painting trivialities up to represent momentous things, and entirely ignoring all that the Company have done, are doing, and are proposing to do to render greater and more effectual service. Everything possible was done to prejudice the Company in the eyes of Lord Haversham's Committee. It was all overdone; and the effect was not the one desired by the Council. Instead of success, a ghastly failure was the result. Mr. J. D. Fitzgerald, K.C., made an excellent choice of ponderous epithets to apply to the management of the Company. "Substantially mismanaged" was one; "scandalously mismanaged" was another. They dropped into the ears of the Committee, and were correctly appraised by them. Mr. E. H. Stevenson and Mr. Frank Jones gave evidence for the Council. The Company had patently given the Council's experts all the facilities needed to rend to pieces the working of the concern during pre-new-management days; and full advantage had been taken of these facilities, and not a grain of adverse detail had been missed. But there had to be confession that the work of the Company was now being conducted upon altogether different lines. We may repeat here that the case for the Council was as much overdone as has been the general attitude of the Council ever since 1911, when the Company (contrary to what happened in 1900 when the Council broke off the bargaining) would not contemplate any negotiations for the sale of their property. Ratepayers came along and said they would rather be under the present management of the undertaking than under that of the District Council; and verily the latter have not shown, by the heavy bias of their hostility to the Company, a capacity for the judicious management of a trading concern. Mr. E. J. Brockway, Mr. R. G. Shadbolt, Mr. Henry Woodall, Mr. William Cash, and Mr. Salmon gave evidence for the Company. It was a good and strong team; and they wholly satisfied the Committee that the Company under its present management deserved confidence. The Council had the purchase clauses deleted from their Bill; and Skegness is saved from the control of, and trading in, gas supply by the local authority.

The Northumberland Clause.

One of the mysterious things concerning municipal trading in electricity supply is the vigorous resistance that is always shown by local bodies to having their finances put under the control of the Northumberland clause. If there is any intention to conduct the concern in a financially sound manner, there cannot or there ought not to be the slightest objection to a clause which simply stipulates that the concern shall stand rigidly on its own bottom, and not have recourse to the rates at any and every time that imprudent administration succeeds in producing a deficiency. Central electricity station engineers ought to welcome the Northumberland clause as a fit and proper companion to the rule that they would like laid down that no part of the profits of any municipal electricity undertakings shall be appropriated to aid the rates. But they describe the clause as a "hampering" one. In what way does it "hamper" them? The only way that we can see is, unless they are prepared to defend the unwise policy of underselling their commodity, by preventing the spreading of deficiencies over the whole body of ratepayers instead of over only those who are electricity consumers. If the Northumberland clause, or its like

is not brought into operation, then the only reasonable alternative is that a rule shall be statutorily laid down that moneys taken from the rates in aid of a trading concern shall be repaid to the rates within a prescribed period. The one or the other is the only means of ensuring sound finance. The electricity concern of Newport (Mon.) has been subsidized out of the rates to the tune of many thousands of pounds; but there is no idea of repaying this obligation. On the contrary, the losses by the concern continue; it has no depreciation fund; and it is under-assessed. What is more, in any public business that is going the Council take all the plums, and leave the little and less profitable things to the Gas Company, who, as large ratepayers, do not appreciate being the victims of financial mismanagement which is not in any way of their own making. The Corporation sought in a Bill this session to take their electric mains outside the borough into the administrative areas of certain other local authorities. The Corporation have not made a financial success of the electricity concern inside the borough; and the element of speculation was therefore present to a still greater extent in the outer area —any deficiencies occurring in which would solely fall on the borough ratepayers, and not on those in the ex-mural districts. The Gas Company could not but resist this fresh piece of municipal blundering; and so they asked Parliament to do one thing or the other—cut out of the Bill this extension scheme, or else place on the Corporation the Northumberland clause. The Corporation did not want the latter, although they know full well that it means legitimate business finance. All their representatives could do was to keep bleating about the "hampering" influence of such a clause. But as to the righteousness of it, not a word from them. Mr. Balfour Browne, K.C., and Mr. A. M. Paddon appeared for the Gas Company; and Mr. T. H. Hazell, Mr. William Cash, Mr. Thomas Canning, and Mr. Arthur J. Stevens, the President of the Ratepayers' Association, gave evidence on the side of the Company. Never was a stronger case presented for the imposition of the Northumberland clause. The Marquis of Bute's Committee, feeling this, intimated during the proceedings that they were so satisfied that, if they granted the additional area, there would be some restriction imposed. But in the event they did not allow the annexation. An application by Mr. Balfour Browne that the Northumberland clause should be applied to the borough was refused, on the ground that there was nothing left in the Bill that was pertinent to the subject. Mr. Balfour Browne had a hand in the origination of the Bermondsey clause, which was the predecessor of the Northumberland and Winchester clauses. Mr. J. D. Fitzgerald, K.C., represented the unsuccessful Newport Corporation in the Committee proceedings.

Capital Redemption.

There is really only one point that is worth notice in connection with the proceedings on the Southend Gas Company's Bill before Mr. Mount's Committee last week. This point is as to obsolete capital, which was argued up and down and in and out, as being about the only peg on which the Corporation could hang any substantial evidence. One of the penalties falling on a gas company through the phenomenal growth of the town it serves may be an amount of obsolete capital; and the Southend Company admit themselves that—owing to the rate at which expansion has taken place, with supersession of plant, and no adequate time for the adjustment of the relations of capital to business done, with, too, a heavy expenditure on prepayment installations owing to the character of the area (being largely apartment-letting residences)—the capital is high and some of it unrepresented. They put the amount of this at £30,000; and Mr. Henry Woodall, who appeared as the expert for the Company, would probably not dispute this. But Mr. E. H. Stevenson, for the Corporation, calculated the obsolete capital at something like £130,000! Between the two widely separated figures, no one appeared prepared to gauge exactly what was a fair representation for the obsolete capital. The Council suggested for the wiping-out of the obsolete capital the infliction of the Preston clause on the Company; but Mr. Stevenson benevolently considered a clause too drastic for the Southend Company which made liquidation of obsolete capital a charge on the sums applicable to dividend. In the result, the Committee ordered the insertion in the Bill of a capital redemption clause. The Company are at present paying a 5½ per cent. dividend; and, after still paying a dividend at this rate, they are to redeem capital to the aggregate of £30,000. On accomplishing this, the condition ceases to have effect. But at the option of the Company, they may also apply from revenue to the same purpose £30,000 by appropriations of £3000 a year. So that capital redemption to the amount of £30,000 is compulsory, and £30,000 is optional. The Company gave up the proposal to purchase the Leigh-on-Sea gas-works, as the Southend Corporation are not willing sellers, although the latter are, by not disposing of the works, apparently breaking faith with Leigh. At the time Southend absorbed Leigh, there was an understanding that the Leigh works should be removed, and the money obtained from their disposal should be devoted to the improvement of the Leigh sea-front. The Southend Company supplied the Corporation with the means of carrying through their obligation which appears to be becoming with time a more and more remote object with them. The Company are also proposing an extension of their area of supply; and the present views of the Corporation as to the Leigh works are seen from the fact that they covet a bit of the area so as to supplement the demand on those works. The Committee compromised the matter by giving the Corporation part of Eastwood and the Company the other part. It does not appear to be a very wise thing to partition between two suppliers a small area such as Eastwood. However, it has been done.

Leighton Buzzard and Calorific Value.

The District Council of Leighton Buzzard took upon themselves a tough task when they resolved to oppose the Bill of the Leighton Buzzard Gas Company. Indeed, we do not believe that they knew exactly the grounds on which to oppose until the Parliamentary Agents suggested purchase, and the ingenuity of Mr. E. H. Stevenson raked-up a few points from which to construct something that, in the absence of a more suitable name, must be called a "case." Mr. Balfour Browne, K.C., was retained to aid the Council; but all that the Council did had no effect upon Lord Lamington and his colleagues, who made it clear, half-way through the proceedings, that they were abundantly satisfied that the Company had been well-managed, and had a clean record. In fact, Mr. Balfour Browne, in his final speech for the Council, said that he had no complaint to make against the Company; and a review of his own witnesses' evidence confirms the safety of the position that he took up towards the close of the proceedings. Thus it comes about that, apart from the changes effected in the Bill by agreement, Mr. Honoratus Lloyd, K.C., and his retinue of witnesses (Mr. R. Richmond, the Chairman of the Company, Mr. H. G. Ruggles, the Manager, Mr. William Cash, and Mr. Henry Woodall) had the satisfaction of seeing the Bill sent forward practically unaltered—the calorific power clauses, of course, remaining in abeyance under the general agreement of the session. About this point of the calorific test, it was incidentally referred to by Mr. Balfour Browne, when he remarked to a witness that the calorific standard of 540 B.Th.U. gross represented 14-candle gas, whereas the Company were supplying 15-candle gas. With all respect, the eminent leader may be warned against letting himself unconsciously into a false position by the assumption that calorific power and candle power have anything very definite in common. The relationship of the one to the other varies with the constitution of gas. It would be possible to show learned Counsel gases of 10 to 12 candle power with a higher calorific value than 540 B.Th.U. gross; and gases of 15-candle power with a lower calorific value. There is something to be learned yet as to calorimetry, by many of the gentlemen who face Committees—"comburimetry," flame temperatures, and as to what is the best gas (it is not necessarily the richest in B.Th.U's per cubic foot) to supply to consumers for general use.

Purchase and Back Dividends.

However, there were only two main points discussed on the Bill—one was the application of the Council for a "sterilization" clause to enable them to come to Parliament with a Purchase Bill next session, without the Company's present Bill appreciating the value of their property; and the other was the objection to the Company utilizing the reserve fund to pay back-dividends on becoming a sliding-scale Company, with an agreed standard price of 2s. 10d., and not of 3s. 6d. as originally proposed in the Bill. The funny part about this purchase business is that the Council have since 1891 had a purchase clause in the Company's Act of that year, and were not aware of it; and now they have suddenly concluded that the Council, who have never had any experience in the gas business, could manage the concern more economically, and do better for the consumers, than the Company, against whom there is no complaint. The Committee (while no doubt admiring the high estimate that is placed by the Council on their own managerial abilities) thought otherwise. As to the back-dividends, there may be differences of opinion as to utilizing the reserve fund for this purpose; but anyway the Company, had they chosen to defer coming to Parliament for a time, and so delay the application of the sliding-scale, could have paid the back-dividends without asking the permission of anyone. But really we cannot detect anything of value in Mr. Stevenson's pronouncement that he did not object to back-dividends being paid if the Company remained a maximum price one, but that this should not be allowed if they were given the advantage of the sliding-scale. The force of the statement lies effectually concealed. The Committee could not see it; and Mr. Stevenson's objection was not shared by them. In considering the question of the advantage of the sliding-scale, it was wrong of Mr. Stevenson not to associate the consumers with the Company, and give them a superior place in the sharing of the advantage. Little slips of this kind on the part of an expert witness may be misleading to a Parliamentary Committee.

Calcutta Public Lamp Contract.—In response to the advertisement by the Corporation of Calcutta which appeared in the "JOURNAL" for Sept. 30 last year, inviting tenders for lamps for the public lighting of the city, four tenders were received from London firms and one local one; and we learn that Messrs. Pontifex and Co., of Regnart Buildings, Euston Street, N.W., were successful in obtaining the order for 2500 all-copper street lanterns, together with the necessary ironwork and copper-tube internal fittings, &c.. The firm have recently completed the last order for 1750 lanterns. The chief factor in the construction of the lantern is that it is insect and wind proof.

ELECTRICITY SUPPLY MEMORANDA.

Most of the electricity supply companies—Metropolitan and Provincial—have, in their recent reports, had something to say concerning the increased cost of coal, and in some cases of oil. An extra price of two shillings (and above) per ton has been mentioned; and the directors of one company say that oil cost them 55 per cent. more. The Chelsea Electric Company, whose generating plant is not quite of the modern order, state that last year coal cost them 0·63d. per unit sold; while others with the newer types of plant boast of a reduced cost per unit, despite the higher price of fuel. The higher price is a serious business; but there is the prospect now of coal being purchased at 2s. less, and oil at easier prices, though the old ones for the latter are not likely to be again reached, in view of the spreading use of liquid fuel. Notwithstanding the reduction of the market cost of coal, the South London Electric Supply Corporation have given notice to their consumers that the price for the supply of electrical energy for lighting purposes will, "in consequence of the continued high cost of coal and other commodities," be increased from 4½d. to 5½d. per unit from that unpleasant date for some people, April 1. The Company, however, condescendingly express their intention to grant a rebate of ½d. per unit from the 5½d. where the supply of energy is given to premises used entirely as private residences (such premises not to include flats, maisonnettes, or residences in the occupation of more than one tenant), *provided that only "the Corporation's supply is used as an illuminant* upon such premises, and the consumer *will undertake, in writing, to conform to this stipulation*, but the Corporation reserve to themselves the right to decline to grant such rebate or to discontinue the same without notice." In other words, this arbitrary Corporation tells the consumer as plainly as is necessary that, for the maintenance of his freedom in the matter of the illuminant he uses, he must pay a higher price. The stipulation is a sign of great weakness. No gas company ever descended to this length in their dealings with private consumers. The terms dictated by the Electricity Supply Corporation are rather one-sided.

A Higher Price.

We do not at all mind seeing an increase of price; but there is interest in inquiring as to the justification for it, because the inquiry throws light on the trend of the electricity business. The "Electrical Times," in referring to the proceedings at the recent meeting of the shareholders of the Corporation, stated that, in spite of the abnormal price of coal, a reduction had been made in works' costs. The Directors, however, make the price of coal the culprit for the addition of 1d. to the price of current to whole-house occupiers, with ½d. off for promising to be good, and not to partially use gas, oil, or candles for lighting. But is the reputed cause, in view of what the "Electrical Times" says, the true one. We think not. A fuller report of the proceedings at the meeting of the shareholders states that the Chairman said: "Instead of the units for motive power being about equal to the units for lighting, as was the case in 1912, the units sold during 1913 for power purposes were nearly 900,000 greater than those used for lighting purposes, with the consequence that, though the rates per unit for lighting and power purposes respectively had been maintained, the average price per unit sold for all purposes had declined, owing to the predominance of the supply for power over that for lighting." What does this show? Not that the increased price should be put on the lighting consumers, but upon the power consumers. We go further, and see another statement which does not supply any justification for a price of 5½d. per unit to the lighting consumers, but it does for a higher price to the consumers of current for other purposes. The Chairman boasted that the expenditure on revenue account worked out to the satisfactory average figure of 0·98d. per unit sold. Just recently Professor Alexander Kennedy stated that about half of the total outgoings of the Metropolitan electric supply companies was for capital purposes. Therefore, in the case of this Company something like 2d. per unit should represent revenue and capital expenditure. With these figures before them, it would be interesting to see how our electrical friends would set about trying to disprove that the lighting consumers at 5d. and 5½d. per unit are not paying part of the costs of the consumers for power and other purposes who are getting electric energy at round about 1d., and whose consumption now rather exceeds that of the lighting consumers. The real cause of the higher price is—not the cost of coal, but the fact that the low-priced units are making an appreciable difference to the average sum received per unit.

The Lighting Consumer Pays.

If we were allowed (say) half-a-dozen guesses as to who was the correspondent who called the attention of the "Electrician" to the article in our issue for March 10 on gas-cooker efficiencies, we should begin with the name of "Grogan;" and probably we should commence with the same name if asked to guess who put "Meteor" of the "Electrical Times" on the same track. However, whether right or wrong, we are delighted at the interest that these gentlemen take in the subject of gas-cooker efficiencies; and, in passing, it may be said that we wish that Mr. Grogan would come out of his retreat, and deal direct with us over the matter of criticisms contained in the "Memoranda" of his platform performances. The anonymous correspondent of the "Electrician," whoever he is, is described as a "discerning" one by the member of the staff of the paper who had to prepare his note for the printer. But his discernment seems to have suddenly broken off at the point where an average of 23 per cent. efficiency was mentioned for the top plates of old types and unnamed gas-cookers. The fact that one of the older makes tested gave an efficiency of round about 30 per cent. on the top missed his notice, and the still more notable fact that the new Richmond cooker has an efficiency for the boiler and simmering burners of 40·7 to 46·4 per cent. is not, of course, mentioned. The stoves that were tested are not the only ones on the market; and presently our electrical friends will have (following the article already published) other improved gas-cooker efficiencies to note as developed by other makers. The same "discerning correspondent" says we "scoff at the figure of 15 per cent. for gas cooking generally"—the figure given by that master of electrical platform platitudes and inaccuracy concerning gas, Mr. Grogan. We continue to "scoff;" and there is nothing in the article concerning gas-cooking efficiencies to prevent us indulging in a most robust scoff at the expense of our friend. The same "discerning correspondent" remarks that these higher efficiency tests are all laboratory ones, and do not include "the enormous oven losses." He is a little vague over these "enormous oven losses." He says: "They admit in oven work a heat loss from various ovens tested (size varying from 1⅓ to 3½ cubic feet) equivalent to that supplied by 6 cubic feet to 11 cubic feet of gas per hour—*i.e.*, from 3000 to 5500 B.Th.U. of heat per hour." Our friend had better explain what he means by this ambiguity, because the figures represent the total quantity of heat put into the ovens, and not the losses. In our issue for March 10, we worked out the quantity of gas that would have to be consumed in an oven to do a certain quantity of work—equivalent to that performed by 3 units of electricity—if Mr. Grogan was right in his statements; and it amounted to 109 cubic feet! Mr. Grogan has supplied us with more fun over this efficiency question than ever has done our remarkable and erratic friend "Meteor."

Cooker Efficiencies.

In the forefront of his remarks on the subject, "Meteor" places, for effect in playing to the gallery, the low griller efficiency of 18 to 20 per cent.—the griller being the least important part of the domestic gas-cooker. The boiling-ring efficiencies, averaging 23 per cent., he also refers to; and, unlike the "discerning correspondent" alluded to in the previous paragraph, he condescends to notice the fact that the new Richmond cooker has boiling-ring efficiencies exceeding 40 per cent. But he has nothing to say about the low consumption of gas required to maintain a given temperature, both in the old and the new ovens—the new especially. Omitting this important point, he observes that, when a year or two ago he credited gas-cookers with an efficiency of 30 per cent., he drew forth the bitterest invective from the writer of "Electricity Supply Memoranda," who threw at him "75 per cent." as a working figure. Now will "Meteor" please supply chapter and verse for this statement? Our recollection is that it was stated that 75 per cent. of the work done by a domestic gas-cooker was on the top plate—that is to say, over the boiling and simmering burners, which is a totally different thing from asserting a 75 per cent. heat efficiency. And this point was made because of all parts of the electrical cooking equipment, the hot plate is the least efficient in ordinary household working. We have no misgivings as to the burners on the new cooker giving in the hands of the domestic user the efficiencies obtained not by an expert cook, but by a member of the technical staff in the works of the makers of the stoves, who has probably never fried a rasher of bacon or baked a few tartlets either to please himself, or an audience at a popular advertising demonstration. "Meteor" excels himself in saying that "when this remarkable stove has been in the hands of the average cook for a year or two, we wonder how much of the 40 per cent. will be left?" Upon the other hand, we wonder what there is about the open bunsen burner and the construction of a gas-cooker that leads "Meteor" to expect that there will be any depreciation of efficiency after a year or two. We are not dealing with electric heating elements in gas-cooking stoves, but with burners that do not change in any way. The trend of modern gas legislation is to a universal standard of calorific power for gas; and the burners on the new cooker are adjusted so as to give at maximum consumption the efficiency claimed for them with a gas of average calorific power. All that is required of the user (say) of the top plate is to have a kettle or saucepan that will cover the flame; and the efficiency will be obtained.

Meteor's Views.

But let us descend from the flights of imagination of the electrical critics (who prefer to deal with the matter of efficiencies in such a partial manner) to the actual practical facts. The boiling-burners on the top plate of the Richmond cooker have an efficiency of 40·7 to 46·9 per cent.; and the consumpton per hour of the oven burners is 1·74 cubic feet per cubic foot of oven space. Mr. Seabrook has said that to compete with the old types of gas-ovens, electricity must be supplied at ½d. per unit. He has a larger experience than "Meteor." The revised Richmond cooker nearly doubles the efficiency of the boiling-rings of some of the older types of gas-cookers; so that

Practical Considerations.

Mr. Seabrook's ½d. also requires revision, so far as this cooker is concerned. We have before us a claim (which we dispute from experience in actual tests) of 59 per cent. efficiency for the boiling-plates of an electric-cooker, which represents, using a unit of electricity, 2006 B.Th.U. If we take 23 per cent. as the average boiling-ring efficiency of old types of gas-cooker (our article on gas-cooker efficiencies showed one tested giving 30 per cent.), we find that of the thermal value of a pennyworth of gas (at 2s. 6d. per 1000 cubic feet), we obtain 3795 B.Th.U. as useful work, compared with 2006 B.Th.U. claimed per unit of electricity. With a 40 per cent. efficiency, we have 6600 B.Th.U. expressed in useful work. The fact remains that, even with the old types of cookers, we can do more work in less time and with greater economy than with any electric-cooker and its appendages in the form of hot-plates. We can equip a kitchen at far less cost to do a given amount of work; and maintenance, repair, and renewal all defy the competition of the electric-cooker. These are points that "Meteor," with all his sneering and other well-cultured characteristics, cannot conscientiously dispute.

Lighting the I.E.E. Theatre.

The "Electrical Times" and the "Electrician" have on previous occasions made broadside attacks upon the lighting and ventilation of the theatre of the Institution of Electrical Engineers—the place of all places that should be well and scientifically lighted and ventilated, in order to demonstrate the claims of electricity. But stagnant air, which produces headaches or somnolence, and bad lighting, which prevents one reading or seeing properly whether a man is awake or asleep, are the truthful allegations against the theatre by friends of the Institution. The "Electrical Review," which once described the lighting as "highly effective" and "a typical application of modern scientific methods to the solution of a difficult problem of illumination" has taken three years to change its mind on this subject. The excuse for this change is worth reading; and as, whenever possible, we like the "Review" to have the honour and glory of its own thoughts and literary efforts, we here reprint them on this subject:

> In the course of three years, changes take place. The novelty has worn off; the candle power of the lamps has probably decreased somewhat; and, above all, the reflecting efficiency of the white frieze appears to have greatly depreciated. At the same time the mahogany panelling has doubtless grown darker. Whether due entirely to such causes as these, or not, we cannot help feeling that there is an indefinable something that is wanting or at fault—an element that militates against the comfort of the audience, and gives one the impression of being seated at the bottom of a mahogany box. It is very difficult to distinguish the features of a friend across the room—almost impossible to say whether his eyes are open or closed. There is a striking lack of contrast, of definiteness. While there is an abundance of light on the horizontal plane, there appears to be too little at an angle with that plane.

This is all excellent. The candle power of the lamps has probably decreased somewhat; and the white frieze appears to have greatly depreciated. And these things in the very home of the electricals! By all the solemn utterances and writings of the electrical man for consumption by the laity, electric lamps ought not to depreciate, and the wielder of the whitewash brush ought not to be wanted for ceilings or friezes for many years exceeding three. What are we now to say to people when they tell us what is electrically poured into their ears on this matter? We need only point to the testimony of the "Review" regarding the lighting of the electricals' own home. The difficulty of seeing whether a man's eyes are open or closed during a paper or lecture in the theatre may be considered a decided advantage by some of the members.

Ventilation in the Commons.

The theatre of the Institution of Electrical Engineers is not by any means the only electrically lighted place that suffers from stagnant air. This has been proved by many illustrations. One of the inducements held out to the authorities (who did not know better) for making a change from gas lighting to electric lighting in the House of Commons was that the condition of the atmosphere would be improved, which shows that scientific knowledge of illuminating agents is not a strong point with the House authorities. Now, after electric lighting has been installed, there is a Committee considering whether the ventilation of the House cannot be improved. The Deputy-Chairman of Committees complains of draughts playing merrily about his feet when in the Speaker's chair. Mrs. M'Kenna finds the ventilation better in the Speaker's Gallery than in the Ladies' Gallery, owing to an open window in the former. Sir R. Pole-Carew asserts that the atmosphere of the House is so dead and heavy that he invariably suffers from headache. In the House he gets extremely sleepy; and he thinks the atmospherical conditions tend to brain confusion. This may account for some of the recent happenings in the Legislative Chamber. Sir Philip Magnus has lately been more subject to influenza than before; and he charges the House with ill-behaviour towards him. Mr. Lyell also testifies to the feeling of deadness in the atmosphere, and agrees that this causes a disinclination to take part in debates. This may be a positive advantage, and not a disadvantage. However, all this with electric lighting established! Electrical professions and practical experience do not harmonize.

GAS AT THE PANAMA EXHIBITION.

Action by the Joint Committee for the International Gas Congress.

In the "Journal" for the 17th inst. (p. 719), it was mentioned that a Joint Committee, of representatives of the American Gas Institute, the National Commercial Gas Association, the Illuminating Engineering Society, and the District Associations, had been formed to take the necessary steps for holding an International Gas Congress in connection with the Panama-Pacific Exposition in San Francisco next year. We have received from Mr. George G. Ramsdell, the Secretary of the American Gas Institute, a letter, enclosing copies of correspondence, on the subject, in the course of which he says:

At the last meeting of the Joint Committee on the International Gas Congress, the subject was quite thoroughly discussed as to a gas exhibit at the Panama-Pacific Exposition; and it was unanimously decided that, unless we could do something very prominent in character and conspicuous in interest, it would be useless to try to do anything. An investigation was at once made to ascertain what chance there was for an exhibit, with the effort in view of trying to secure some certain portion of the lighting where a proper display could be made. As you will see by the correspondence, the San Francisco Company have laid a high-pressure 16-inch main all around the Exposition ground, and have at least one-half of the area that will be lighted exclusively by gas. They have also secured a satisfactory high-pressure lamp; and in all probability there will be about 300 of these lamps in use. So that the gas features of the Panama Exposition will prove a great incentive for attendance in America of the Gas Congress.

In a further letter Mr. Ramsdell said:

You are aware that an International Gas Congress will be held in San Francisco during the week beginning Sept. 27, 1915, and during the Panama-Pacific Exposition. We are exceedingly anxious to make this Gas Congress of such interest and prominence as the industry deserves. We have a Committee consisting of six prominent gas engineers, members of the American Gas Institute, and one delegate appointed by each of the Gas Associations in this country. The entire Committee now consists of twenty-three members, with four or five other Gas Associations to be added.

The American Gas Institute has consented to manage this congress. As Secretary, I, of course, have a very large share of the work; while at the last meeting of the Joint Committee I was also appointed Chairman of the Committee on Publicity. Very little has been done thus far excepting in this country; but active steps are now being taken to prepare and send out invitations to foreign Gas Associations, and we hope to have the foreign Gas Press assist in this matter.

I shall expect to send you from time to time information of progress; and it is hoped that we shall have a large and influential delegation from abroad, and that at least two or three papers will be contributed by foreign members.

Heretofore at any exposition in this country the electric light people have had almost all the lighting of the grounds, buildings, &c., and have occupied a very prominent position. Fortunately for the gas fraternity, these conditions are quite reversed, as we now expect the lighting display and other novel effects will show gas lighting in exceedingly satisfactory and attractive form.

Enclosures.

San Francisco, March 6, 1914.

Mr. W. H. Gartley, Chairman,
Joint Committee on International Gas Congress.

Dear Mr. Gartley,—I have your letter of the 24th ult. with respect to high-pressure gas lighting at the Exposition, and also with reference to getting into touch with the Japanese Gas Society. I permitted Mr. Jones to read your letter, and he has practically answered it in letter to me under date of March 3, which I herewith enclose. Also, for your information, I enclose letter from Mr. Bayley, of the Exposition Company, to Mr. Shaw, of the Welsbach Street Lighting Company, and a map of the grounds showing the area to be lighted with gas. I am sure that these will prove in every way satisfactory to you, and overcome any misconception of the scheme of gas lighting brought about by the letter of Mr. Ryan to which you refer.

(Signed) John A. Britton,
Vice-President and General Manager.

San Francisco, March 3, 1914.

Mr. John A. Britton,
Vice-President and General Manager,
Pacific Gas and Electric Company,
San Francisco (Cal.).

Dear Sir,—In reference to Mr. Gartley's letter of Feb. 24, which you referred to me, I have had a long conversation with Mr. Bayley, Chief Mechanical and Electrical Engineer of the Panama-Pacific Exposition Company, in regard to the lighting of the grounds. I find that the question as to what portions of the grounds will be lighted by gas and what portions will be lighted by electricity does not rest with Mr. Ryan, but comes directly under Mr. Bayley, who has charge of that department.

I find that it has been arranged to instal about 300 high-pressure

gas-lamps in the avenues west of Baker Street, including the state pavilions, foreign pavilions, stock exhibit, and whatever will be done by the United States Government. Also all of the lighting in the Concessions Street from Fillmore to Van Ness Avenue, which will be done by the Exposition Company, will be gas. Gas will also be used, as indicated by Mr. Ryan, in all parts of the grounds after closing hours, and all exit lights will be of gas. There will also be new lighting features using gas for illuminating, as described in an article "Lighting Effects with Gas and Steam" in the "Journal of Electricity, Power, and Gas," of Feb. 28, 1914, a copy of which I have sent to Mr. Ramsdell and to Mr. Gartley.

In regard to a special exhibit of gas lighting by our Company, Mr. Bayley has offered us the choice of three locations, or, if we please, we may have all three of them. First the main avenue leading from the California State Building to the circle in front of the Massachusetts building—this avenue is 60 feet wide—and the circular avenue leading from the Fine Arts Palace at Baker Street to the Massachusetts State building, and also the Esplanade on the Bay of San Francisco, from the California State Building to the Athletic Field. This comprises one half of the entire water front of the Exposition grounds. With these locations, and with high-power lamps close enough together, we should be able to make electric lights in the Fair Grounds cast shadows on the buildings. This will also stimulate an interest in the Exposition, and particularly in the International Gas Congress, to the advantage of our industry.

Mr. Bayley has already taken up the matter of street lighting by gas with Mr. Arthur E. Shaw, the President of the Welsbach Street Lighting Company; and I am enclosing a copy of his letter, under date of Feb. 28, sent to Mr. Shaw. He has also furnished Mr. Shaw with a full-sized detail plan of the lamp-post and lantern approved by the Exposition Company.

In reference to the invitation of the Japanese Gas Association, I will take this matter up with Mr. Hiramatsu, Chief Engineer of the Tokio Gas Company, and Mr. Charles P. Cushman, First Vice-President of the Osaka Gas Company, Limited, and will get some information regarding the Japanese Gas Association and send it to you as soon as it reaches me.

[A small map of the Exposition grounds, showing the portions which will be exclusively lighted by gas, was enclosed.]

(Signed) E. C. JONES.

San Francisco, Feb. 28, 1914,

Mr. Arthur E. Shaw, President,
Welsbach Street Lighting Company,
Philadelphia (Pa.).

My dear Mr. Shaw,—Your letter of the 20th inst. reminds me that I overlooked reporting to you the results of the test we made here of the high-pressure gas-lamp. It is a pleasure to inform you that the results were most satisfactory, and the lamp aroused a great deal of interest among the engineers hereabout. I was surprised to find that the mantles were so strong. We varied the pressure from 3 lbs. to 6 lbs., with apparently very little effect on the mantle.

We have not lost sight of the gas installation, and I am sending you under separate cover the design which we have worked out for the post. You will note on the full-scale detail that we have changed the design of the chimney and base, and we would like to know if the change will in any way affect the operation of the lamp. These posts will be made of staff and painted to represent bronze. If you will cut the drawing in two and then hang the drawings up with the lamp at the stated height, I think you will get a very good impression of the beauty and dignity of the design. This design is the work of an experienced fixture designer. The modelling and casting will be carried out under the direction of Mr. Paul Denniville, who did the Pennsylvania Depôt and the interiors of some of the finest hotels and restaurants in New York. The painting will be in charge of Mr. Jules Guérin, whose reputation ensures the work being of the finest.

We contemplate requiring from 250 to 300 high-pressure gas-lamps, and we would like to ascertain on what basis we could secure these lamps from your Company. The plan in mind would be to have you ship us the lamps, globes, and automatic lighting and extinguishing devices; we to pay the freight both ways and a nominal sum covering the depreciation of the apparatus due to the use to which it will be subjected. Anything in the way of mantles or other supplies we would naturally expect to purchase outright.

If an agreement could be entered into for the use of the lamps, we would use them to light the States and Foreign sites, which are approximately one-third of the entire Exposition area. There would also be a number used throughout the Exhibit Buildings Section for emergency and all-night lighting. We plan to shut off the electric lights after the crowd leaves the grounds every night, and rely upon gas lighting for patrol purposes.

We believe this will be a splendid opportunity to exploit gas lighting in general, and your high-pressure lamp in particular; and I know that you will take these advantages into consideration in making us a proposition, and that you will also bear in mind the amount which we will expend in order to provide a handsome post on which to mount the lamp.

In order to show your high-pressure system to the best advantage, we plan to use your lighting and extinguishing device, and would pipe the lamps up so as to utilize this mechanism.

(Signed) G. L. BAYLEY,
Chief Mechanical and Electrical Engineer.

The following is the article that is referred to in the preceding correspondence:

LIGHTING EFFECTS WITH GAS AND STEAM.

By WALDEMAR H. F. N. DE BILLE.

Steam and gas will be extensively used in some of the original schemes for night illumination of the Panama-Pacific International Exposition. It is believed that some of the most spectacular effects will be gained where these are combined. This will be particularly noticeable in the Court of Abundance, in which the architect has taken for his theme the creation and development of the earth, and has presented a symbolic idea of the history of man from the prehistoric day to the present. The rise of man and the development of the earth has been treated by a series of graduated scales; the lowest form, or the unicellular life, being presented on the ground level, and the various stages of advance noted on ascending planes.

The court will be illuminated almost exclusively by means of high-pressure gas. Urns will be placed about the court and on the borders of a still lagoon in the centre, from which twisted gas flames 10 to 15 feet in height will rise. Great sheets of flame will lick the fireproof sides of the court, and rise along the façades and up the scores of columns supporting huge carved figures of prehistoric men. A haze will hang over the entire court, created by steam forced through perforated pipes laid along the ground level. The cloudy vapour and the reddish-yellow flames will produce an effect of mystery which the entire architectural scheme will carry out. It is the intention of the designer to have gas released under pressure just beneath the surface of the water in the lagoon which will be ignited upon striking the air. The details of this ingenious plan, however, have not yet been worked out.

As a substitute for the usual pyrotechnic displays, steam will be used at the Panama-Pacific International Exposition. While this is not unique, having been successfully used to a slight degree at the Hudson Fulton celebration in New York, this will be the first occasion upon which it will take the place of fireworks.

Set-pieces of pipe in various shapes are being made and placed near the Scintillator—a battery and forty-eight 36-inch searchlight projectors—on the bay front of the site. Through these pipes steam under high pressure will be forced to a height of 300 feet or more. An automatic device at the base will cause the steam to be turned on for a certain number of seconds and then shut off. The vapour will assume form under the coloured rays of the Scintillator, waver, and dissolve like wraiths into the upper air.

The gas used at the Exposition will be distributed through a high-pressure system by a San Francisco Company, and will be the oil gas made of crude petroleum commonly used in California. Its heat value is 600 B.Th.U. per cubic foot, and it has a candle power value in excess of 18. Being exceptionally free from sulphur and other impurities, it will be used for heating in all the buildings. A low-pressure system will also be operated at about 6 inches water pressure for lighting purposes in the various buildings.

HIGH-PRESSURE GAS SYSTEMS.

JUST recently it was mentioned in our "Correspondence" columns that a correspondent was desirous of obtaining a list of towns in which high-pressure mains are laid, and from which business is done with consumers—that is to say, he does not desire information merely as to high-pressure systems for transmitting gas from district to district. In a subsequent communication, he tells us that he is surprised, from inquiries made, that there are so few concerns in the country that have high-pressure systems from which they do business direct with consumers, while there are so many which compel consumers to provide private compressing plants if a supply of gas is desired at a pressure higher than the district one, and thus cause much waste of money, seeing that individual compression costs so much more per unit of gas compressed than is the case with a single plant giving a general supply. Of course, this point as to cost depends mainly on the amount of custom and the capital expenditure involved in relation to that custom in providing the system. But still our correspondent is of opinion that more might be done, in these days of stiff competition, in the way of providing a general supply of gas in main streets at higher pressures than the district normal.

Mr. W. B. M'Lusky, of Halifax, sends a few figures that are highly interesting, as they show how popular the high-pressure system for lighting purposes has become in the borough. It was only in October, 1912, that high-pressure gas was first supplied; and a beginning in this branch of business was made with twelve lamps of 1000-candle power. Six months later—that is to say, by the end of March, 1913—there were 154 lamps connected to the system, of which 112 were each of 1000-candle power, and 42 of 600-candle power. By last Tuesday, the total number of lamps connected had grown to 386—viz., 8 of 1500-candle power, 216 of 1000-candle power, and 162 of 500-candle power. This is a smart rise in popularity, and reflects credit on the commercial department of the Halifax Gas Department.

Mr. C. F. Botley writes with reference to the invitation for particulars that the Hastings and St. Leonards Gas Company have had a high-pressure lighting system since the close of the Franco-British Exhibition at the White City. A 3-inch steel protected main with rigid joints is laid partly in the footways from the works in Queen's Road to supply the principal streets in Hastings. The pressure is 80 inches; the lamps principally of the Keith type. Similar lighting is projected for St. Leonards from the Company's show-room in London Road; but nothing so far has been done with the mains in St. Leonards. There are also several isolated installations; the Company's plan being to pick these up if the system extends, and thus they are utilizing smaller distributing mains than otherwise would be the case.

In our "Correspondence" columns last week, Mr. James Taylor, of Mossley, gave some information regarding his high-pressure gas system.

The British Mannesmann Tube Company, Limited, have kindly supplied the following list of towns where steel tubes are in use for high-pressure purposes. The list is not nearly a complete one,

because the firm are not always aware whether the steel tubes supplied are to be used for high or low pressure work.

Towns Using Steel Mains for High-Pressure Gas.

Aberdeen.	Glasgow.	Nottingham.
Aldershot.	Grays.	Nuneaton.
Basingstoke.	Greenock.	Oldham.
Bath.	Great Grimsby.	Ormskirk.
Belfast.	Guildford.	Plymouth.
Birkenhead.	Halifax.	Prescot.
Birmingham.	Hastings.	Preston.
Blackpool.	Hornsey.	Radcliffe.
Bolton.	Ilford.	Redhill.
Bournemouth.	Ilkeston.	Richmond.
Bradford.	Kirkcaldy	Snodland (Kent).
Brentford.	Leeds.	South Shields.
Brighton.	Leiston.	Southampton.
Burnley.	Lichfield.	Southend.
Cardenden.	Lochgelly.	Southgate.
Cardiff.	London.	Southport.
Cheltenham.	Luton.	Stafford.
Chorley.	Maidstone.	Stockport.
Corbridge.	Maldon.	Sunderland.
Cowdenbeath.	Manchester.	Swansea.
Cullen.	Melrose.	Tottenham.
Denny.	Mossley.	Tynemouth.
Derby.	Musselburgh.	Waltham Abbey.
Dudley.	New Mills.	Woking.
Dundee.	Newcastle-on-Tyne.	Wolverhampton.
Dunfermline.	Newport (Mon.).	Wrexham.
Edinburgh.	Norwich.	

NOTES FROM ABROAD.

Gas Rates at the Panama Exhibition.

According to a circular which has been issued respecting the governing of exhibits during the period of the above-named exhibition, to which reference is made elsewhere, the rates for gas in each calendar month or fraction of a month will be $1 per 1000 cubic feet for any consumption up to and including 50,000 cubic feet, and 80c. per 1000 feet for what is consumed beyond this quantity. The meters will be installed by the Exhibition Managers; and the minimum monthly bill will range from $2.50 to $15, according to the size of the installation.

The Strassburg Gas Contract.

At an extraordinary general meeting recently held, the shareholders of the Continental Union Gas Company sanctioned the new contract entered into with the Municipality of Strassburg, to which reference has been made in the "JOURNAL," for the formation of a new Company, and the sale to them of the existing works and plant for a sum of Mk. 3,999,000 in shares and a cash payment for the stock. They also approved of the provisional arrangements made for the sale of the lands for Mk. 3,441,000.

Education of Fitters.

The gas undertaking of Wiesbaden seems to have found a good way of settling this question. The method adopted of ensuring that fitting shall be properly carried out is simply to refuse a supply to houses where any but approved fitters have worked. There is no question of forbidding private men to work, but if they have not the approval of the authorities, their work is in vain. The question arose some time ago, and a case was brought before the Courts against the electricity department, when it was decided that this constituted no infringement of private traders' rights.

Large Tar Distillery.

The Anglo-American Tar Products Company have just settled on a large scheme, by which plant is to be erected at St. Louis at a cost of $250,000 (over £52,000). At the same time a ten years' contract has been signed with the Laclede Gaslight Company to take the whole of the tar produced by this concern from the beginning of next year. The plant is to be ready to be put into operation by that time. It is estimated that between 7 and 8 million gallons of tar will be available annually from the Laclede Company, mainly from the huge coke-oven plant now in course of construction.

German Illuminating Engineering Society.

The "Journal für Gasbeleuchtung" for March 28 contains a report of the fourth general meeting of this Society, of which brief mention was made in the "JOURNAL" for Jan. 27 (p. 218). The meeting was held in Charlottenburg on Jan. 24 under the presidency of Herr Warburg, and 80 members were present. The papers were read as previously announced, and in that on guiding-lights for sea and air craft, Herr Klebert mentioned the preponderance of oil as fuel for lighthouses, and explained the uses to which gas can be put in this connection. After the meeting there was an exhibition of a large number of various forms of lamps for lighthouse and kindred purposes, which were shown working.

A Large Gas Flambeau.

In the "JOURNAL" for the 17th of February (p. 428), an illustrated description was given of the gigantic new building which has been erected by the Consolidated Gas Company of New York for carrying on their business. In addition to its interesting architectural details and interior arrangements, there is an exterior feature which is probably unique. It is in the form of a flagstaff on the top of the building. In the daytime it resembles any other pole; but at night, by an ingenious mechanical contrivance, it is converted into a flaming torch. The pole is 65 feet long, and has a hollow shaft filled with gas which is ignited at the top; producing a large flame that may be seen from long distances. It is a flash-torch—alternately burning and extinguished.

Seven Years' Gas Free.

The Omaha Gas Company has made a claim against the estate of a man who has just died, and who, the Company asserts, has used all the gas he wanted for the last seven years without paying anything. He had a gas range, a heater, and two lighting burners, and bye-passed the meter. The Company estimates that the value of the gas he has used in the seven years would amount to about $937, and this is the sum claimed. Either he must have been an exceedingly cunning thief, or, as seems more probable, the Company has been very easily swindled, if, as is asserted, no gas was paid for during seven years.

Unwelcome Cold Weather.

The St. Joseph (Missouri) Gas Company will have cause to look back with anything but pleasure on the extreme cold weather experienced in February in the U.S.A., which to many companies brought record business. This particular concern ordinarily supplies natural gas, obtained in bulk from the Kansas Natural Gas Company. The demand during the recent cold snap could only be met by mixing some 20 per cent. of artificial gas with the natural. The Company then tried to charge a price for the mixture by basing the artificial gas at $1 per 1000 cubic feet, and the natural at the usual price of 40 c. But the authorities upheld an objection to this on some technical points of law, by which decision it is estimated the Company loses $10,640.

Snow on Gasholders.

An inquirer in the "Gas Institute News" of America asks whether it is ever necessary to clear snow from the crown of a modern holder. In the answer it is strongly recommended to do so. A writer from Schenectady, where a fall of snow of 24 inches in 36 hours had just been experienced, estimates that this is equivalent to 24 lbs. pressure per square foot, or 4·6 inches of water column. This would raise the water in the cups to that amount, perhaps cause it to overflow, and give serious trouble. Moreover, the writer points out that snow rarely collects uniformly, and high winds accompanying its fall may cause it to drift to one side of the holder more than the other, and thus put undue stress on the carriage rollers and guide frame. He estimates that a 2-foot fall of snow on a 2-million feet holder of 144 feet diameter would weigh approximately 391,000 lbs., which is certainly an excessive weight on the crown.

German Association of Gas and Water Engineers.

It was announced in the "JOURNAL" for Jan. 20 (p. 148) that it had been decided to change the *venue* of this year's meeting of the German Association from Dortmund (which was the choice approved at the preceding meeting) to Munich, in order that the members of the Association might participate in the opening of the gas exhibition which is to be held at Munich in the autumn. The date of the opening of the exhibition has now been settled; and the arrangements for the meeting of the German Association have been made accordingly, as follows: On Tuesday, June 30, Inaugural Reception; Wednesday, July 1 to Friday, July 3, Morning sessions for technical communications, &c.; Wednesday, July 1, in the evening, Opening of the Exhibition (by His Majesty King Ludwig III. of Bavaria); Friday, July 3, evening banquet; Saturday, July 4, an excursion.

The applications of neon—one of the five rare gases contained in the atmosphere—for lighting purposes, are very curious. The Paris correspondent of the "Chemical News" points out that Professor d'Arsonval has presented to the Academy of Sciences a work of M. George Claude, showing that large neon tubes are not superior to small ones, as the production of light in them depends on the product of the volts by the amperes—that is, on the force expended. On the contrary, the luminous production remains excellent, and of the rank of 0·5 watt per candle, down to very small diameters—10 mm. and less. It becomes then easy to make very short tubes, exceedingly easy to manipulate, giving a very weak luminous force with an excellent production, which had been impossible up till now for lighting by luminescence.

Most readers of the "JOURNAL" are aware that Mr. Thomas Newbigging, M.Inst.C.E., D.Sc., finds recreation in the pursuit of literature; his works having been noticed in our columns from time to time. His latest production is an article on William Cobbett, contributed to the "Manchester Quarterly" for January last. It has been reprinted in pamphlet form, and is published by Messrs. Sherratt and Hughes, of London and Manchester. A copy has been forwarded to us by the author. In acknowledging it, it is not uninteresting to point out that, curiously enough, there is a rather close connection between William Cobbett and the "JOURNAL;" for we believe that some of his publications, if not the renowned "Weekly Register" itself, were issued from a house in Bolt Court which stood on the site of the present offices. At all events, on several occasions we have received—generally from abroad—orders for books by the remarkable man to whose life-work Mr. Newbigging has been directing his attention.

EVENT AND COMMENT.

[COMMUNICATED.]

WHEN can a process or system be said to be past the experimental stage? In a report of a gas committee meeting of a certain council the other day it was stated that a councillor objected to the installation of vertical retorts on the ground that they were not yet out of the experimental stage, and that present evidence was not sufficient to ensure their reliability. This might have been true five years ago; but to-day surely there can be no question about it. There are at work in different parts of the world considerably more than a hundred installations, many of them of at least four or five years' standing; and in some cases they are the sole gas-making plant. If the councillor's ideas are correct, then no system is ever out of the experimental stage; for all types of plant are continually undergoing modification and improvement, and scarcely any two plants are exactly alike in detail, though they may be the same system.

ONE gathers that coke-oven carbonization is attracting a good deal of attention in the country just now—probably on account of the notice given to the Birmingham plant. Its scope, however, is necessarily somewhat limited, for various reasons. One of its chief recommendations is the fact that furnace-coke can be produced. As far as the South is concerned, however, this has little weight, owing to the fact that the demand for such coke is very small indeed through the comparative absence of the heavy industries. In the North, there is, of course, a demand for metallurgical coke; but in many cases this can be better met from existing coke-ovens. Hence competition would be somewhat keen. On the other hand, it is to be remembered that furnace-coke is not a *sine quâ non* of bulk carbonization. It also has claims as a gas-producing system—particularly from the labour point of view; while ordinary coke can also be produced if desired. The different classes of coke are obtained by varying the methods of charging the coal into the ovens.

WILL benzol ever be recovered from gas which is used for town purposes? As long as flat-flame burners are in existence, there will be strong opposition to any diminution of the illuminating power below about 14 candles, measured by the No. 2 burner. Of course, the use of flat-flames is diminishing; but even gas committees responsible for the lighting of the public thoroughfares have not made the change completely. "Example is better than precept," goes the old proverb; and what more natural for people to say something in the nature of, "If it pays the gas authority not to make the change, should it not pay me just as well?" It needs a very clever canvasser, and a very good argument, to get over this reasoning—unsound as it may be. Not very long ago a well-known gas engineer stated that, though his parliamentary standard was only 14 candles, yet he was sending out 18-candle gas, and simply dare not reduce it to any extent Even very slight reduction brought him in a host of complaints. On the Continent, 10-candle power gas is not at all uncommon; and its use gives satisfaction, But then, in most cases, the consumers have not been used to anything else; while it is not very long since 20-candle power gas was common in this country. In many cases now in England, where the gas is only about 14 candles, the extraction of the benzol would almost totally destroy the illuminating power and would reduce the calorific value by about 10 per cent. As things are at present, such procedure would certainly bring out a great deal of opposition.

THE tendency of retort construction at the present time is certainly towards the use of built-up retorts, thus involving the use of brickwork construction. This, in turn, involves a large number of joints; and each joint is a potential source of trouble in connection with leakage. And it will not be denied that leakage, either of coal gas into the flues or of flue gas into the retorts, is a serious matter. With built-up retorts, too, especial care is necessary in the choice of a suitable brick, particularly for the hottest portions of the retorts; while due allowance has to be made for the expansion of the bricks. We have heard a good deal lately with regard to the corrosive effect on refractory material of salt contained in the coal. This may not be of extreme importance when composite retorts are used; but it becomes a very serious matter in the case of brick retorts. With certain classes of coal, this corrosion is very rapid, and the brickwork needs replacing after but a short time. There is an opinion in many quarters that British brick makers are behind their Continental *confrères* in studying and coping-with such matters, and it has been stated that it is not outside the bounds of possibility that certain Continental brick-works are ready to make a determined bid to capture the English market as soon as a suitable opportunity arises. They can offer a good material, and are able to guarantee its behaviour under all conditions. In the light of recent happenings—such as, for example, the contracts let by the Port of London authority to German firms—patriotism will only keep the contracts in this country so long as it pays the companies concerned not to go elsewhere.

THE NORWICH METHOD OF WORKING TOWER SCRUBBERS.

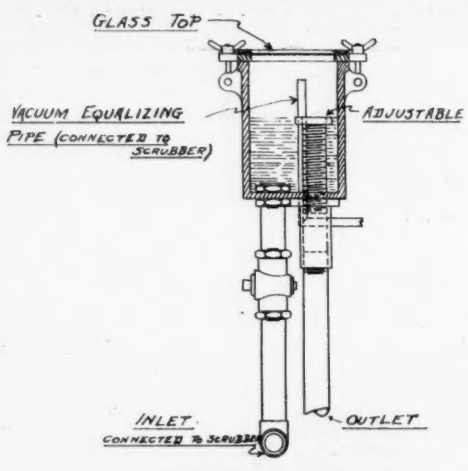
By THOMAS GLOVER, M.Inst.C.E., of Norwich.

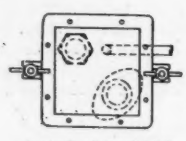
IN accordance with the suggestion that was made by your correspondent, "Modus Operandi," I have pleasure in adding to my remarks on the subject of improved methods of working tower scrubbers, as given in my presidential address to the Southern District Association.

By the use of plate-glass windows in the lower part of No. 2 scrubber, we are able to observe the flow of washing liquid from the filling material, as the windows are underneath the supporting grids carrying the filling material, which in our case are boards on edge. Our observations show that there is perfect and ample distribution of liquor; and the quantity works out to 0·145 gallon per foot of area per minute. I would have no hesitation in using this as reliable data on which to base the quantity to be recirculated through the scrubber.

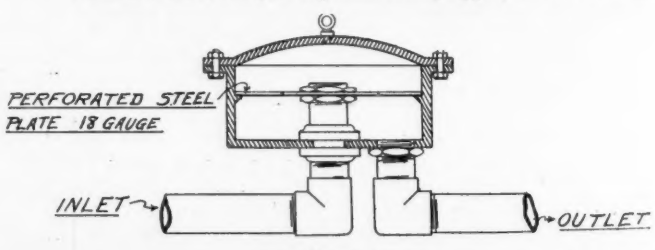
In addition to the windows in the lower part of the scrubber, another set is in use opposite the space where the sprays are fixed, about two-thirds of the distance up No. 2 scrubber. By the use of these, we have been able to see that the sprays are doing their work as they were designed to do. The efficient distribution of the liquid and the perfect washing of the gas, of course, depend on the filling material of the scrubbers being kept clean; and this is only possible if the tarry matter and naphthalene are first removed by oil-washing.

It would appear to be almost impossible to remove tar-fog by washing with liquor. This is clearly shown in our case by the fact that when the Livesey washer containing the tar oil is shut-off for a short time, tar-fog immediately appears in the lower part

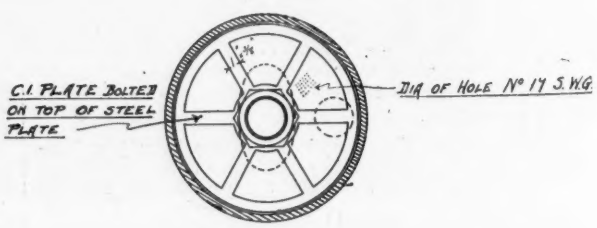




Detail of Seal Pot.



Scrubber Details.



Detail of Strainer.

of the No. 2 scrubber; and it is then impossible to see anything through the windows, which at other times are so clean that it is possible to see right across the yard through the clean glass. The tar-fog has escaped absorption in the washer in the lower part of No. 1 scrubber and in the scrubber itself. It will be seen that oil-washing is a very effective method of removing tar-fog.

The sprays of No. 1 scrubber (as has no doubt been observed from the diagram published in the "JOURNAL") are supplied with liquor from the sump-tanks, containing the condensed liquor from the retort-house and foul-mains. Previous to the use of a strainer, the sprays frequently became blocked; and although the pump appeared to be doing its duty in the ordinary way, the quantity of liquor coming through was very much reduced. The strainer, a larger section of which I now send you, has effectually prevented this occurrence, and we find carbonized material and other solid matter deposited on the straining plates. This undoubtedly comes from the hydraulic mains.

One other improvement to the scrubbers which I did not mention in my address, is the sealed sight overflow attached to each scrubber. This provides ready means of observing the quantity of liquor circulated through the scrubbers; and as they are sealed, there is no smell about the scrubbers and no loss of ammonia.

THE WOODALL-DUCKHAM VERTICAL RETORT INSTALLATION AT WEST BROMWICH.

OWING to the very limited ground space available for the extensions of their carbonizing plant, which had become absolutely imperative, the West Bromwich Gas Department—acting on the advice of their Engineer, Mr. Harold E. Copp—decided to put down an installation of vertical retorts on the Woodall-Duckham continuous system. [See *ante*, p. 848.]

The installation consists of five settings, each containing four retorts; the whole being capable of producing 1,250,000 cubic feet of gas per twenty-four hours.

The site chosen for the installation was one bay of the old horizontal retort-house which originally contained three settings of eight through retorts. The vertical settings have been placed across the retort-house, the single bay of which has been so reconstructed as to accommodate the new settings. The old walls of the house have been used again as far as was possible, and new ones added only where required.

From the old eaves level of the house, a steel-framed structure has been extended to cover-in the settings, filled in at the ends on one side with paneled brickwork, and sheeted-down on the other side with corrugated asbestos sheeting—making the new retort-house a good, sound, substantial building. Ample light and ventilation have been provided for the house by means of large windows in the side and end walls, and ventilators on the roof fitted with glazing for the length of the settings.

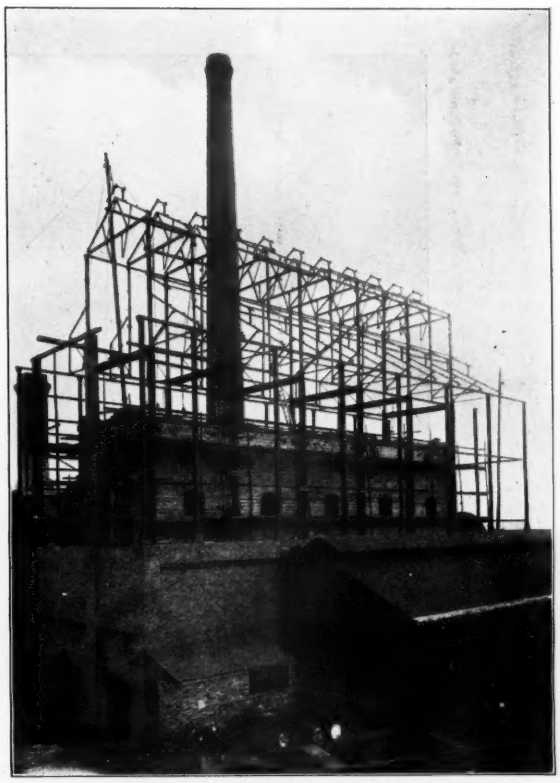
The working of the installation has been made as automatic as possible. It is not necessary for either the coal or the coke to be touched by any hand labour from the time the coal is delivered in trucks to the retort-house, to the time the coke is taken away in carts from the works. The coal is brought to the settings in trucks on the gas-works sidings, and tipped by means of a hydraulic tipping ram—being emptied into a receiving hopper. From the hopper the large coal is fed by means of a jigging screen through a 40-ton per hour four-roll coal-breaker; the small coal passing through a bye-pass shoot into a rotary filler placed above a 50-ton per hour gravity bucket conveyor.

This conveyor is arranged to encircle the settings, and deliver the broken coal into the overhead storage hoppers above the settings. From here it passes, on its way to the retorts, through a rotary valve into the auxiliary hopper attached to the top retort mouthpiece. The rate at which the coal travels through the retort is governed by the speed of extraction of the coke at the bottom of the retort.

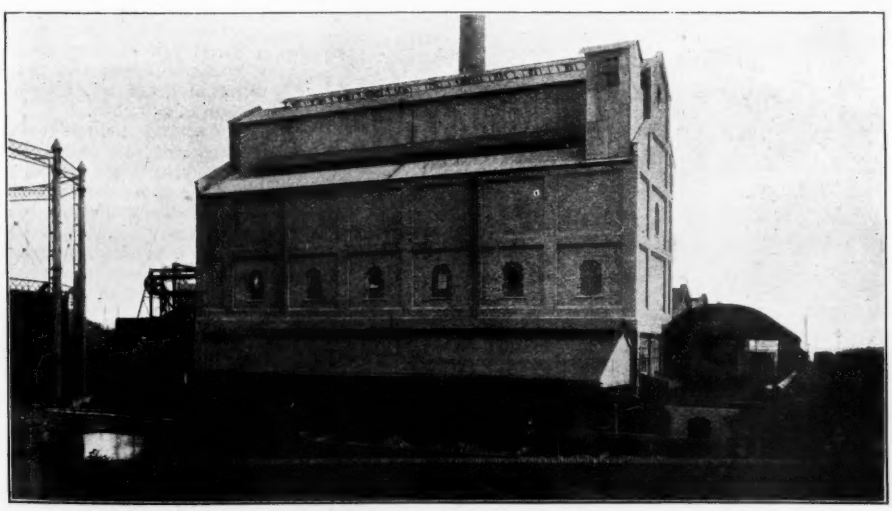
The extraction of the coke is carried out in the usual way by means of a patent extractor roller formed of a series of cast-iron crosspieces, mounted on a square shaft—each crosspiece having a slight lead on its neighbour. This construction ensures that the discharge of coke is the same through the whole of the revolution of the extractor roller; and therefore the travel of the charge throughout the retort is constant.

Underneath the extractor is a coke-hopper, from which the coke is extracted (at intervals) through a patent water-sealed door, and discharged through a special travelling rotary filler on to the gravity bucket conveyor, which runs in a trench in the retort-house floor.

The rotary filler is a very ingenious arrangement—being fitted



The West Bromwich Retort-House under Construction.



The West Bromwich Retort-House, showing the Coal arriving at one end and Coke being discharged at the other.

with small jiggers to give an even feed of the coke through the filler and prevent any possibility of choking. It is mounted on a framework, so that it can be run under any of the retorts.

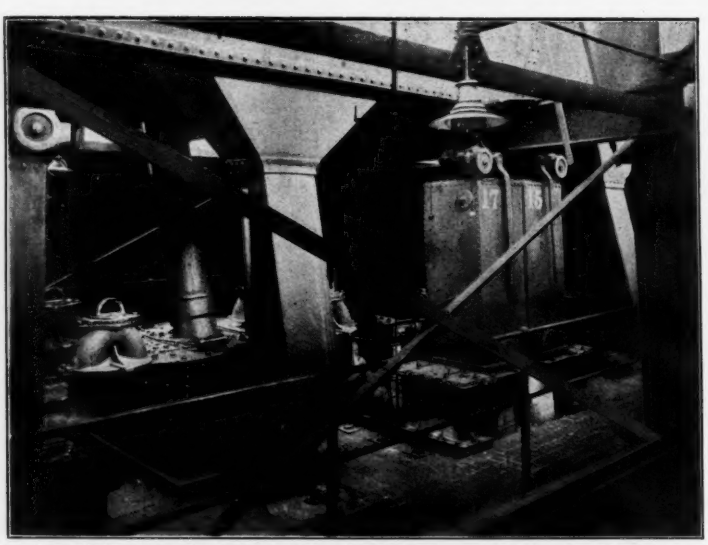
The gravity bucket conveyor takes the coke required for firing the settings up to the overhead storage hoppers above the settings, which contain compartments for coke above each producer, from which the coke is fed by means of a shoot directly into the charging hole of the producer.

The remaining coke is taken by the gravity bucket conveyor from underneath the retorts outside the retort-house, and either delivered into a coke-storage hopper, of 80 tons capacity, so arranged that carts can be run underneath and filled direct with coke, or else into a tray conveyor, which takes it to the coke-screening plant which was in use with the horizontal retorts.

In case of a breakdown to the gravity bucket conveyor, a hydraulic lift has been provided at one end of the retort-house, by means of which coal and coke skips can be taken from the ground level up to the overhead storage hoppers. The lift is used in the ordinary way for taking passengers to the various platforms and gangways from which the settings are regulated.

The Top of the Coal and Coke Bunkers, showing the Portable Dumper and Delivery Shoots from the Conveyor.

The Clinkering Stage of the West Bromwich Retort-House.



Top of the Setting, showing the Shoot from the Coke-Hoppers for Charging the Producers, the Auxiliary Coal-Charging Hoppers for the Retorts, the Gas Off-take Pipes, &c.

The whole of the conveying plant (except the waggon tipper and the lift) is worked by means of electric motors operated upon a direct current of 230 volts.

The settings themselves have been built to the standard practice of the Woodall-Duckham Company, by which the heating is most intense round the upper portion of the retorts, so that the gases are evolved as quickly as possible. The primary air, before being taken to the producers, is passed round the bottom of the retorts, thereby extracting as much heat as possible out of the coke before it is discharged.

One feature of note in this installation is the perfect ease of regulation. The man working on the top of the settings can, without leaving this level, attend to the coal feeding into the retorts, and the coke feeding to the producers; and he can, by means of the sight-holes above the combustion chambers, watch the heating of each of the retorts. It is claimed that in no other system of vertical retorts is it possible to supervise the complete installation from one level.

WORKS TOPICS—XXVI.

By "Modus Operandi."

MANY gas engineers will agree that the Presidential Address delivered by Mr. Thomas Glover to the Southern District Association was exceptionally rich in the number of valuable ideas propounded. It may be confidently prophesied that these will bear fruit in scores of works.

MOISTURE IN COKE.

Very timely was his suggestion that the coke yard and hoppers should be covered by a roof wherever possible. In many works this could be done at a very reasonable expenditure. Far too little attention has been paid to the question of the moisture in coke. Managers should make it their business to know daily the moisture content of the coke they are selling. It is, it must be admitted, a difficult matter to quench coke uniformly. The tendency is to drench one portion of a charge in the endeavour to quench the remaining portion. Now that the whole question of coke is receiving more attention, methods of quenching should be reconsidered; and the recounting of experiences in this direction would at the present juncture be very opportune. If any engineer has ideas on this subject they would, I am sure, be welcomed in the columns of the "JOURNAL."

In this connection, it may be worth while drawing attention to an arrangement which has much to commend it. It consists of a tank of a certain determined capacity, fitted with a ball-cock and placed immediately above a large perforated spray of a size to completely cover the receptacle, whether truck or barrow, that is used for removing the hot coke from the retort-house. Where this arrangement is fitted, there is little risk of overdoing the quenching, as the minimum quantity of water required to quench the actual amount of coke contained in a barrow or truck can be ascertained by experiment. It should be noted that the spray should be constructed of the same size as the receptacle in which the hot coke is quenched to ensure an equal distribution of water. For the same reason, too, the receptacle should preferably be rectangular in shape, so as to contain an equal quantity of coke per square foot of area. This idea would, of course, be suitable only in certain works.

Two further points may be mentioned. The floor on which the coke is quenched or stored should be drained, and should have an even and sloping surface. It should not be possible for water to stand at any point under the coke. Again, it is advantageous to separate the coke from the breeze as soon as possible. Breeze is absorbent and retains much water, and if stored with coke it will have the effect of gradually soaking the latter. Mr. Glover's remarks on the suitability of twelve-hour coke for purposes for which foundry coke has hitherto been used should be duly noted, and advantage taken of introducing this new gas coke into such markets.

OIL ECONOMY IN WATER-GAS MANUFACTURE.

Mr. Glover's method of economizing his oil consumpton in the Norwich carburetted-water gas plant is not the least valuable of the hints contained in his address. One thing that is obvious is that gas oil at its present price is much above its intrinsic value for gas-making purposes. The same result in calorific and illuminating value can be obtained in the coal-gas process at a much lower cost; but this only applies to the carburetting part of the water-gas process. Water gas, or blue gas as it may be termed, can be made as cheaply as ever; so that Mr. Glover's method of making coal gas of proportionately high grade and of diluting it with blue gas or low-grade carburetted water gas should be tried experimentally in other works, so as to determine whether, under the particular conditions, there is economy in so working.

FURNACE GRATE AREA.

It is not so long since the question of furnace grate area was referred to in this column. Mr. Glover states that a grate area of three-quarters of a foot per 10 ft. 6 in. run of retort is sufficient only with certain coals, but with other coals containing different proportions of lime and iron in the ash, the clinker is difficult to remove. My own recent experience has been connected with retort-houses in which the furnace grate area has been 0·82 square feet per 10 ft. 6 in. run of retort in the one case and 1·12 square foot in the other; and there is no doubt that there is considerable advantage from every point of view in arranging for a grate area of at least 1 square foot per 10 ft. 6 in. run of retort. At Norwich the grate area was increased by doubling the furnaces in use, which step was apparently taken to overcome difficulties in removing clinker; for, as Mr. Glover states—"it is our duty, as far as possible, to find remedies and provide improved alternatives where jobs are of a galling nature which give no satisfaction to the worker. The clinkering of furnaces affords an illustration."

MECHANICAL CLINKERING.

This forms a fitting preface to the following remarks on a recent addition to the mechanical plant available for use in gas-works. I refer to the furnace clinkering machine, invented by Mr. G. M. Gill, of the Commercial Gas Company, which was described in the "JOURNAL" for March 17, p. 721. The object of the machine is to lighten the heavy work of clinkering, which is undoubtedly a most arduous operation. In gas-works this particular work is usually allotted to men of strong physique; for the tools to be handled are very heavy, and it is important that the job should be completed as quickly as possible. With the air supply to a furnace carefully regulated, it is obvious that the consumption of fuel is greatly increased while the clinkering door is open. For this reason it is undoubtedly of considerable advantage to ensure that the cleaning of the furnace is effected with the least possible delay. The work of clinkering may be divided into four parts: (1) The insertion of a false grate and the removal of the permanent fire-bars; (2) the removal of the clinker; (3) the replacement of the permanent grate and corresponding removal of the false bars; and (4) the emptying of the clinkers and ashes from the ash pit. Of these operations all but the second can be undertaken by any labourer of average strength and intelligence. The actual work of cutting away clinker, often exceedingly hard, can only be done with efficiency by the strong arm of a skilful fireman. It is this work, and this only, that the new machine is designed to accomplish.

The whole operation of clinkering a large single regenerative furnace, including the emptying and removal of the ashes, usually occupies one man about an hour, provided that the coke in use is of average quality. It would be fair to assume that of this hour from a third to a half is occupied in cutting away the clinker. Presumably, therefore, the machine in question should save about 20 minutes on each occasion that a furnace is clinkered. At first sight this might not appear to be very substantial; but to those who appreciate the full significance of the effect of removing work of an intense nature it will be obvious that the question must be looked at from a different standpoint than from that of the mere saving of so many minutes.

Manual labour may be divided into different categories: (1) Work of an easy nature for which no spell of rest is expected or allowed; (2) work of a moderate degree requiring short periods of rest; (3) work of a fairly arduous character, for which "recognized periods of spell are allowed; and (4) work of an "intense" nature, for which long periods of rest and recuperation must be allowed. In class No. 1 we have most of the skilled workers and those engaged in light manual labour; in class No. 2 would be placed workmen engaged in the loading and wheeling of barrows and work of this description; in No. 3 we should find retort-house stokers; and in No. 4 those who have very hard work to do under exceptionally bad conditions, such as in very hot places or with heavy tools. In this last category the actual removal of clinker must be included. It is work that, when completed, has for the time being thoroughly exhausted the man, who quite reasonably requires a spell out of proportion to the time worked.

For instance, it might be argued that men in other walks of life—such as boxers or professional footballers—are engaged in "intense" work, which only occupies them for a very short time during each day, but is of such a nature that it could not be substantially increased without loss of efficiency. We may, therefore, conclude that the removal of the "intense" work from the operation of clinkering should make it possible for a man to do a great deal more than previously, and with less fatigue. We are, in fact, told that one man with the aid of the machine can do the whole of the clinkering work, including the removal of furnace ashes, for retort-settings making 1,200,000 cubic feet per diem. This speaks for itself. Other advantages claimed are that, owing to the shorter period during which the furnaces are open, fuel is saved; that wear and tear on false bars is much decreased; and that smith's labour on clinkering tools is also substantially reduced. We shall expect to hear shortly of its adoption in other works; for being, presumably, of low initial cost and adaptable to three forms of power, its employment should be extended even to works of very modest size.

[I should like to take this opportunity of thanking Mr. W. J. Rendell Baker and Mr. W. H. Adams for replying to the points recently raised in these notes.]

Masonic—Evening Star Lodge, No. 1719.

The installation meeting of this Lodge was held at the Freemasons' Hall, Great Queen Street, last Wednesday, when the retiring W.M. (W. Bro. William Edgar) installed his successor in the chair, W. Bro. Edmund G. Smithard, of King's Lynn. The Treasurer elected for the current year, W. Bro. Arthur Valon, L.R., was duly invested. The other officers of the lodge are:

S.W.	W. Bro.	A. E. Croager.
J.W.	,,	J. F. Wicks.
Secretary	,, ,,	Walter T. Dunn, L.R.
S.D.	,,	A. P. Main.
J.D.	,, ,,	F. J. West.
I.G.	,, ,,	H. W. Packham.
Director of Ceremonies	,, ,,	Jacques Abady.
Stewards	,,	Corbett W. Woodall.
	,,	H. G. Warren.
	,,	A. C. Beal.
Organist	,,	J. F. Simmance.

The I.P.M. was presented with a jewel in recognition of his services to the lodge during the past year; and a pleasing feature of the meeting was the gift of a Past Master's collar and jewel by the five brethren who were initiated into masonry during his year of office.

SOME OBSERVATIONS ON LOW TEMPERATURE CARBONIZATION.

By "Amicus."

During the last few months we have been almost inundated with schemes for the profitable utilization of coal by means of low-temperature carbonization; and if only the schemes would stand the strong search-light of scientific and practical criticism, then indeed the promoters would be in for a good thing. Unfortunately for those processes which do possess undoubted merits, such extravagant claims have been made in certain cases, that any low-temperature process is now almost regarded with an air of suspicion and doubt. From a commercial standpoint, many features have to be considered before a scheme can be carried forward. Assuming, in the first instance, that suitable raw material is available at a reasonable price, and that satisfactory results are obtainable, consider for just a moment the disposal of the various products.

As things are in this country, no scheme can be satisfactory which does not include the disposal of all the products—that is, the low-temperature coke, the gas, the tar, the light oils, and the sulphate of ammonia. As far as the last two are concerned, these can be got rid of in almost any quantity. The smokeless fuel or semi-coke is perhaps the most difficult proposition. It must be sold at a price at least 50 per cent. above the cost of the raw material. Furthermore, in order to produce any large demand for it, it must be available at a price less than that of coal. It is all very well for hygienists to talk about a smokeless atmosphere; but no amount of hygienic reasoning will make people buy a high-priced fuel if a lower-priced one is at all available. Again, assuming for the moment that people would pay the increased price, would not the most probable result be that the colliery companies who supply both domestic coal and raw fuel for the carbonizing plant would be likely to raise the price of the latter and lower the price of the former—thereby seriously damaging the prospects of the smokeless fuel? Is it not a fact that the present high prices of gas coal have been partly brought about through the increasing use of gas-fires and the consequent competition of gas with coal for domestic use? Further, if the smokeless fuel were manufactured privately, and if it became a serious competitor of gas-coke, the gas companies might without very much difficulty put on the market a very similar product at "cut" prices.

From this point of view, it would appear that colliery companies are the most favourably situated for the operation of this type of plant. On the other hand, however, against this is the fact that collieries are generally situated some distance away from the centres of consumption, and hence transport of the smokeless fuel is involved. The soft character of this fuel would, of course, result in a very large production of breeze in transit, thereby very considerably diminishing its value. The gas produced can easily be utilized for power purposes on collieries; but its value in such case is very small—probably not more than about 2d. per 1000 cubic feet. The yield of gas available after deducting that required for heating purposes will not be more than about 3000 cubic feet per ton of coal carbonized, giving a value for the gas of about 6d. per ton of coal. Against this has to be set the fact that the value of the gas per ton of coal to a gas engineer is in the neighbourhood of 25s.—thus leaving a margin of about 24s. 6d. per ton of coal to be made up out of the other residuals. This is a task by no means simple.

Tar produced by low-temperature distillation is paraffinoid in its character, and contains none of those bodies which the ordinary tar distillers want—carbolic and cresylic acids, &c. Low temperature tar is, however, a very valuable commodity, and could with advantage be distilled by the producer.

Another very important point to be considered, and one which is frequently left out of account, is the quality of the semi-coke produced. To make a good coke, a good coal is required. So often is one told that inferior grades of fuel can be used for these processes. This is quite true, within limits. If the fuel is inferior, so also are the residuals—both in quality and quantity. If a fuel containing (say) 20 per cent. of ash is used, this will become almost 30 per cent. in the coke; and such coke would not long find favour in the eyes of any but the ultra-enthusiastic—and it might be added non-existent—domestic. Such coke would, of course, be quite unsaleable, and the revenue of the plant would thereby suffer considerably.

A statement has recently appeared in a technical contemporary that by a certain process up to 130 gallons of tar oils per ton of coal can be obtained. No information, however, is vouchsafed as to the class of fuel to be used; nor does it state what the yields of gas, ammonia, coke, &c., are in this instance. It is just statements of this kind which have brought ridicule upon the subject of low-temperature carbonization. Consider for a moment what comes from a ton of coal. Take, for example, a good class of cannel coal, from which the highest yields of oil can be obtained. It will be admitted that it might be possible under the best conditions to get (say) 60 gallons of oil per ton. In addition might be expected 5000 cubic feet of gas, and perhaps 20 gallons of liquor—an item usually missing from low-temperature calculations. Then there would be (say) 8 per cent. of volatile matter left in the semi-coke. The tar would, therefore, represent, approximately, 650 lbs. weight; the liquor, 200 lbs.; the gas, 250 lbs.; and the volatile matter in the coke, 150 lbs.—leaving an unvolatile residue 990 lbs., or 44 per cent. by weight. None but the very best cannels would give such a yield as this; and furthermore it has to be remembered that the coke produced from such a coal would be absolutely useless. A possible yield of 130 gallons of oil is, therefore, very remote.

The yield of ammonia is also the subject of much exaggeration. It is a well-known fact that the maximum yield of ammonia by distillation is not reached until a much higher temperature than 1000° Fahr. is attained; and yet it is often claimed that from 40 to 45 lbs. of sulphate per ton can be obtained from coal that under the best conditions of distillation does not yield more than 30 to 35 lbs. per ton. The higher yields can only be obtained if steaming is employed; and where this is done, the coke necessarily suffers.

It must also be borne in mind that the majority of the tests described are made under conditions which certainly could never obtain in actual practice. A small plant is used, every detail of which is under the immediate and personal supervision of skilled operators; and no account is taken of the costs of carbonization. What would be the results if the plant were in the hands of the average British workman? With a test plant carbonizing a few tons of coal a day, and operated by a doctor of science and a skilled engineer, undoubtedly good results can be obtained. But at what cost? We are also told that there is a ready sale for the smokeless fuel at prices higher than those paid for coal. For the purposes of getting out a satisfactory balance-sheet, in order to gull the public, some directors are not above burning the fuel themselves for a time, and of even acting as coke salesmen among their personal friends. What would be the position when, instead of perhaps at the most 20 tons per day are produced, something like 20,000 tons would need to be got rid of?

PROFESSOR BONE ON SURFACE COMBUSTION.

Second Howard Lecture at the Royal Society of Arts.

There was again a large audience at the Royal Society of Arts on Monday last week, when Professor W. A. Bone, D.Sc., F.R.S., delivered his second Howard Lecture on "Surface Combustion." It consisted mainly of demonstrations of the application of the phenomena of flameless combustion to the heating of furnaces; and, as on the previous occasion, it was illustrated by numerous experiments and lantern slides.

A Prefatory Explanation.

The lecturer prefaced his discourse with a short historical statement in regard to the subject to be subsequently dealt with. He explained how, in 1906, after the publication of the first instalment of his scientific researches in conjunction with Mr. R. V. Wheeler, he decided to develop his ideas technically; and in December of that year he made provisional arrangements with Messrs. Wilsons and Mathiesons, Limited, of Leeds, to co-operate with them in the matter. On the appointment, however, in 1907, conjointly by the Institution of Gas Engineers and the University of Leeds, of a Committee to investigate the efficiencies of gas-fires (the experiments to be carried out in the lecturer's laboratories at the University), it was thought inadvisable for him, as a member of the Committee, to direct another investigation in collaboration with an outside firm who were makers of gas-fires. He accordingly suspended his own investigations until October, 1909, when they were resumed in association with Mr. C. D. M'Court.

Before any further experiments were made, Dr. Bone deposited with a bank, on Oct. 16, 1909, a signed statement in a sealed envelope, which was not opened until Oct. 23, 1913, defining the nature of the problem, and his proposed solution of it, in the following terms: "To bring a combustible mixture of gas and air in suitable proportions into contact with the interstices of an incandescent porous solid of suitable composition and porosity, in such a manner as to produce a flameless, or as nearly as may be a flameless, surface or interstinal combustion, whereby the porous solid shall be maintained in a continual state of incandescence." How closely the subsequent realization of the phenomenon in the two processes which he proposed to describe and illustrate had corresponded to this original definition of it, he must leave his audience to judge; but he wished to place the definition on record, as evidence of the precise position to which the scientific researches in the laboratory had led him before the actual industrial investigation had begun.

The lecturer said the new system of incandescent surface combustion evolved at the works of Messrs. Wilsons and Mathiesons under his direction, during the three following years, consisted principally of two processes in which a homogeneous explosive mixture of gas and air, in the proper proportions for complete combustion (or else with air in slight excess thereof), is caused to burn without flame in contact with a granular incandescent solid, whereby a large proportion of the potential energy of the gas is immediately converted into radiant form. The advantages claimed for the new system were: (1) The combustion is greatly accelerated by the incandescent surface, and, if so desired, may be concentrated just where the heat is required; (2) the combustion is perfect with a minimum excess of air; (3) the attainment of very high temperatures is possible without the aid of elaborate heat

recuperative and regenerative devices; and (4) owing to the large amount of radiant energy developed, transmission of heat from the seat of combustion to the object to be heated is very rapid. These advantages are, as Dr. Bone believes, so uniquely combined in the new system, that the resultant heating effect is for many important purposes not only pre-eminently economical, but also easy of control.

Diaphragm Heating and its Applications.

The lecturer then proceeded to illustrate the application of the two processes to which he had referred. He first started a porous diaphragm of refractory material by turning on the gas and igniting it as it issued at the surface. He then gradually added air until the flame became non-luminous. Finally, all signs of flame disappeared, and there remained an intensely glowing surface throwing out a radiant heat which could be maintained as long as required. He called attention to the fact that the actual combustion was confined within a very thin layer (one-eighth to one-fourth of an inch only) immediately below the surface, and no heat was developed in any other part of the apparatus. He demonstrated that while the front of the diaphragm was intensely hot, the back was so cold that he could lay his hand upon it. The combustion of the gas, though confined within such narrow limits, was perfect, for, when once the relative proportions of gas and air had been properly adjusted, no trace of unburnt gases escaped from the surface. The diaphragm method of heating might be applied to many domestic and industrial purposes. Dr. Bone said he thought it might be employed for warming apartments; and experiments are being made in this direction. The lecturer referred at this point to the electric grill fixed at a large restaurant in London, to which he alluded in his recent Royal Institution lecture [see *ante*, p. 572].

Turning to the industrial field, Dr. Bone gave an instance of the employment of diaphragms in a large confectionery factory for boiling and concentrating sugar solutions. There were thirteen boiling-pans in constant use; and the gas consumption was stated to be only half what it was when the pans were heated by ordinary atmospheric flame burners. Another interesting application of diaphragm heating shown was the evaporation and concentration of liquids by means of downward radiation from a diaphragm fixed horizontally above the surface of the liquid. The lecturer said the advantages of such a system were obvious; but its commercial development depended not so much upon the actual thermal economy realized as upon the cost of a high-grade gaseous fuel as compared with coal. With coal at 12s. a ton and coal gas at 1s. per 1000 cubic feet, the prime cost of a given number of heat units was still about four-and-a-half times higher in the form of gas than in the form of coal, though the greater economies and other advantages obtainable with gas largely wiped-out the difference in final cost.

Surface Combustion in a Bed of Refractory Material.

The lecturer next gave illustrations of his second process, which is applicable to all kinds of gaseous or vaporized fuels. It consists in injecting an explosive mixture of gas or vapour and air into a bed of granular refractory material, which is disposed around, or in proximity to, the body to be heated. He showed the application of the process to the heating of crucible and muffle furnaces, and pointed out its adaptability for all kinds of furnace operations. He claimed for the process the possibility of the attainment by its aid of much higher temperatures than can be reached by the usual methods of flame combustion without a regenerative system. In order to show the thermal efficiency of the new process as compared with the ordinary methods of flame heating, Dr. Bone threw on the screen the results, in tabular form, of a test on a surface combustion muffle furnace, in which a muffle 9½ in. by 5½ in. and 3¼ inches high was maintained at temperatures between 815° and 1425° C. with coal gas of 540 B.Th.U. net per cubic foot at normal temperature and pressure. This conclusion was confirmed by independent trials carried out in New York shortly after the lecturer's visit in 1911. In the case of large furnaces of the muffle type, regenerative arrangements might, the lecturer said, be advantageously added. His further remarks on this subject were mainly on the lines of those made in his Royal Institution lecture [see *ante*, p. 573].

Melting of Easily Fusible Metals and Alloys.

This subject was the last one dealt with. Dr. Bone described and illustrated a modification of the granular bed process applicable to the continuous melting of all easily fusible metals, such as lead or type metal. He explained the construction of the apparatus, which consists of an iron tank efficiently lagged, and filled to the top with molten lead at a temperature some 50° C. above its melting-point. In the molten bath is fixed a vertical iron tube, 3 feet long, and 3 inches internal diameter, packed with suitable granular refractory material. An explosive mixture of gas and air is burnt in the tube, solid lead is fed continuously into the tank, and the molten metal allowed to run over through a spout. In the test described, the quantity of lead melted per hour was 1176 lbs., with a consumption of 100 cubic feet of gas of the net calorific value of 559 B.Th.U. per cubic foot. The heat required to raise 1 lb. of lead from 15° C. to 372° C., including melting, was reckoned by Dr. Bone at 32·67 B.Th.U. Consequently the heat transmitted to the lead per hour during the experiment was $1176 \times 32{\cdot}67 = 38{,}420$ B.Th.U., whereas the net calorific value of the gas burnt per hour was 55,900 B.Th.U.; the ratio being $38{,}420 \div 55{,}900 = 0{\cdot}686$. Inasmuch, however, as the net heat of combustion of the gas was based on the assumption that the products (less steam) were cooled down to 15° C., whereas in the experiment the temperature of the molten metal was 372° C., the lecturer said it followed that the high ratio of 0·686 did not do full justice to the merits of the system. Under ideal conditions, the temperature of the gas leaving the combustion-tube could not have been reduced to below 372° C.; but it was actually brought down to within 150° C. of this limit. Taking these circumstances into consideration, Dr. Bone calculated the efficiency of the melting operation as being practically 80 per cent. of that theoretically possible.

[After the lecture, which was warmly applauded, an inspection was made of a muffle furnace in operation upon the platform.]

GAS FOR METAL MELTING.

Sheffield University Experiments.

A number of members of the Sheffield Master Silversmiths' Association last Thursday responded to an invitation by Sir Joseph Jonas, the Chairman of the Applied Science Department of the Sheffield University, to visit the non-ferrous metallurgical section, and acquaint themselves with the resources provided for the investigation of problems that are from time to time met with in the lighter trades.

Professor J. O. Arnold, D.Met., who received the visitors, explained that the objects of the department could only be achieved by the goodwill and co-operation of the manufacturers. Describing in detail a complete series of experiments carried out to establish the relative merits of melting by coke, oil, and gas, he said that though no claim was made to finality, the results based on a long run of 14 hours, involving an aggregate weight of brass of nearly a ton, showed a strong *prima facie* case for the use of gas as a fuel for melting non-ferrous metals. The cost of gas per 100 lbs. melt was much lower than that of coke. This was due to the special advantage the city enjoyed from the low price of gas; and he thought it would be for manufacturers to consider the commercial possibilities of substituting a gas melting system for the existing coke methods. The cost of oil rendered the use of this form of fuel prohibitive, though it possessed an outstanding value for the purity of the product as regarded sulphur.

The question of oxidation had not yet been dealt with; but experiments were being put forward whereby the relative merits of the three systems of melting in this particular would be established. The coke-furnace was of the ordinary type found in local shops, having a capacity of 90 lb. pots; the oil-furnace was of similar capacity, the air being under a pressure of about ¾ lb. per square inch; and the gas-furnace had a capacity of 70 lb. pots, and worked with a forced draught of 1 lb. per square inch. With regard to the gas and oil furnaces, it was pointed out that the smaller pot used for 30 lb. did not give the maximum result possible to be obtained, as a certain amount of heat was wasted in using the smaller pots. The melting of cupro-nickel—the most refractory alloy demanded by the silver trade—had been quite easily accomplished by both the gas and oil furnaces.

Particulars of Experimental Run.

	Coke.	Oil.	Gas.
Output on a 14-hour run (total 2220 lbs. brass)	720 lb.	750 lb. (*a*)	750 lb. (*a*)
Weight of charge	30 lb.	30 lb.	30 lb.
Number of casts	24	25 (*b*)	25 (*b*)
Time taken for melting initial 30 lb. charge, starting with cold furnace	89 min.	70 min. (*c*)	78 min.
Time taken for melting subsequent charges, minimum	22 min.	20 min.	19 min. (*d*)
Time taken for melting subsequent charges, maximum	37 min.	41 min.	34 min.
Time taken for melting subsequent charges, average	29 min.	29 min.	27 min.
Fuel—cost	24s. per ton	80s. per ton	10d. per 1000 c.ft.
Fuel, heat value, British thermal units	12,960 per lb.	19,700 per lb.	570 per c.ft.
Consumption of fuel per 100 lbs. brass melted	66 lbs.	4·1 gall.	383 c.ft.
Consumption of fuel per 100 lbs. brass costing	8·6d.	15·3d.	3·8d.
Electrical energy for blast at 1d. per unit	*nil*	3·3d.	1·1d.
Cost of graphite crucibles (on a basis of a 48-heat life)	2·5d.	3·3d.	3·3d.
Total cost of melting 100 lbs. brass	11·1d.	21·9d.	8·2d. (*e*)
Zinc loss on 100 lbs. brass, per cent.	0·40 (*f*)	0·85	0·44
Sulphur (absorbed from fuel) per cent. per cast	0·0040	0·0010 (*g*)	0·0026

Deductions.

(*a*) Oil and gas, though working to a disadvantage in the small charges used, secured greater outputs.

(*b*) These, with increased facilities, would probably have reached 27.

(*c*) The heating from "dead cold" to first cast shows an advantage to the oil-furnace.

(*d*) Gas shows the lowest minimum for any 30 lb. charge—viz., 19 minutes from charging to pouring.

(*e*) This shows a distinct saving in favour of gas; the relation being – gas 100, coke 135, oil 267.

(*f*) Coke melting, with special care, shows the lowest zinc loss (0·4 per cent.).

(*g*) Oil melting yielded the purest product (sulphur content). This would vary with the type of oil used.

COMPARISON OF ESTIMATED AND OBSERVED VALUES OF ILLUMINATION.

By W. C. Clinton, B.Sc., Professor of Engineering at University College.

[Extracts from a Paper read at the Meeting of the Illuminating Engineering Society on Tuesday, March 17.]

The object of this paper is to institute a comparison between results actually attained in artificial lighting installations and their predetermination from known data of the types of illuminants used. The resultant horizontal illumination on the working plane in foot-candles will be considered in all cases; the comparison being between this quantity as calculated for given positions and the values obtained by photometry at the same positions.

For a source sufficiently small to be regarded as a point, and having a given polar curve, well-known rules will at once give the horizontal illumination at a point due to such a source. The sum of these values taken for all the sources installed will give the total horizontal illumination at the point.

This is the value that would be found if the walls of the room were indefinitely far away or were perfectly black. If walls having a given coefficient of reflection are imagined to move in closer and closer to the lights, then the horizontal illumination will be increased more and more by reflection from them of portions of the total flux of light from the lamps which before escaped without affecting the illumination at the point considered. The amount by which the illumination is thus increased will depend on three things:

(A) The colour and texture of the wall and ceiling surfaces as determining their coefficients of reflection. Floor surfaces are usually dark, and their effect may be neglected.
(B) The dimensions of the room compared with the area enclosed by the light sources.
(C) The nature of the polar curve. A curve with great lateral extension will give a horizontal illumination of which a greater percentage is due to reflection from the walls than would be the case where most of the light is directed downwards.

The above-described point-by-point method of calculation will, therefore, give in general lower values of the horizontal illumination than those observed; the difference diminishing as the effect of walls and ceiling is made less and less, either by their colouring or their distance from the lights. Apparent exceptions may arise; but it will always be found that if the calculated values by this method are higher than those observed, the conditions in the data assumed are not fulfilled in the installation.

The "flux of light" method enables one to deduce the total flux of light shed by each source on the floor, and so arrive directly at the mean horizontal illumination.* If the flux going to the walls and ceiling be neglected, the mean horizontal illumination arrived at in this way should agree with that deduced by the first method, provided that a sufficiently large number of points are selected, correctly disposed over the area.

The calculations are quickly made; but the analysis of the distribution of light afforded by the more laborious point-by-point method is wanting.

A third procedure is to calculate from the polar curve the total flux of light liberated in the room, and then to compare the mean horizontal illumination that would be produced if the whole of this flux arrived on the plane of reference with that actually measured. In those cases where this has been done, the value of the total flux up to any angle from the vertical has been arrived at graphically from the polar curve by Dr. Kennelly's construction.

The ratio,

$$\frac{\text{total flux sent on to the reference plane}}{\text{total flux from source}}$$

or which is the same thing,

$$\frac{\text{mean horizontal illumination observed}}{\text{mean horizontal illumination due to total flux}}$$

might perhaps be termed the utilization factor of the installation. To get the total utilization of the light produced by the source without any shade, the above factor would have to be multiplied by another giving this ratio for the fitting itself.

Examples were then given—the first being the lighting of a workshop by tungsten lamps in metal reflectors; then a drill-hall lighted in the same manner; followed by a church and railway booking office, both lighted with tungsten lamps in prismatic glass reflectors. Then we come to

Schoolroom Lighted by Low-Pressure Incandescent Gas.

In the class room of an elementary school, where inverted gas-burners with suitable shades were installed and spaced as shown in fig. 1, point-by-point calculation for points immediately under the lamps, and for the corners and middle of the sides of the room, gave the following figures:

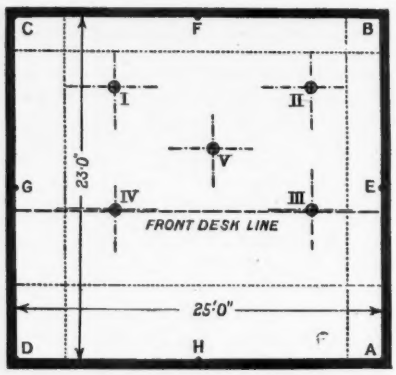


Fig. 1.—Plan of Lighting of School Class-Room.

Table I.—*The Summary of Calculated Values.* (*Fig.* 1).

Position.	Illumination in Foot-Candles.	Position.	Illumination in Foot-Candles.	Position.	Illumination in Foot-Candles.
I. . . .	5·5	A.	0·61	E.	2·46
II. . . .	5·5	B.	1·50	F.	1·99
III. . . .	5·5	C.	0·98	G.	1·65
IV.. . .	5·5	D.	0·51	H.	0·84
V. . . .	6·6	—	—	—	—

The tabulation for the point A is given in Table II.; and the polar curve of the combined unit is shown in fig. 2. Actual test under the lamps gave about 5 foot-candles on the desks, slightly below the calculated values in Table II.

Table II.—*Detailed Illumination Values for Position A. Fig.* 1.

Lamp.	Total Distribution.	Total Distribution.	Cos. θ.	θ.	I.	Normal Illumination.
I. . .	715	26·75	0·262	74° 50′	87	0·0318
II. . .	405	20·1	0·348	69° 40′	100	0·086
III. . .	171·6	13·1	0·535	57° 40′	107	0·334
IV. . .	482	21·95	0·319	71° 25′	97	0·064
V. . .	382	19·55	0·358	69°	100	0·094
						0·610

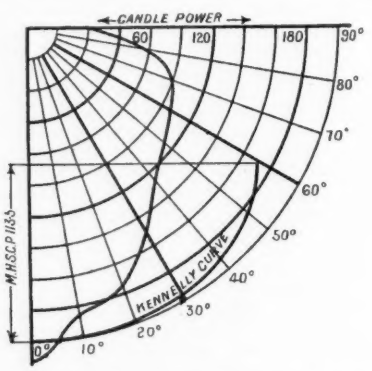


Fig. 2.—Polar Curve of Lamp and Fitting used in School Class-Room in Fig. 1.

The mean hemispherical candle power from fig. 2 is 113·5; so that, neglecting the upper hemisphere, the light put forth into the room is

$$2\pi \times 113{\cdot}5 \times 5 = 3570 \text{ lumens,}$$

which if it were all shed on to the plane of reference of 575 square feet would give an average illumination of

$$\frac{3570}{575} = 6{\cdot}2 \text{ foot-candles.}$$

The mean value calculated from the results shown in Table I. is approximately

$$\frac{2100}{575} = 3{\cdot}7 \text{ foot-candles.}$$

And as the observed values tended to be less than the calculated values, the utilization factor has a maximum value of

$$\frac{37}{62} \text{ or 60 per cent.}$$

* Dr. L. Bloch, "Grundzüge de Beleuchtungstechnik," English translation, p. 61.

The low value is largely due to loss through windows of relatively great area.

Local Lighting by Incandescent Gas over a Workshop-Bench.

With local intensive illumination at specified points, the point-by-point method of calculation is the only one suitable. Its application is shown in a case of high illumination by inverted gas-burners over a workshop-bench. Fig. 3 shows the spacing, and

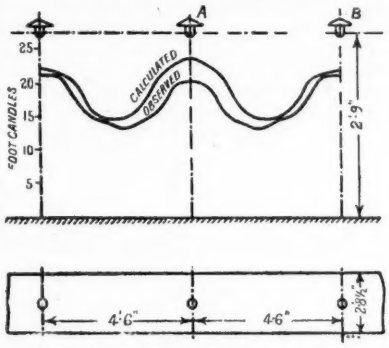


Fig. 3.—Illumination of Workshop Bench.

plan of bench, together with calculated and observed curves of illumination. The figures are given in Table III.; and the polar curve in fig. 4.

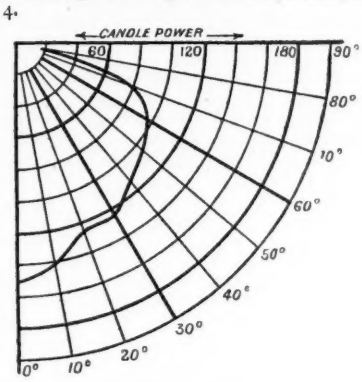


Fig. 4.—Polar Curve of Lamp and Fitting used in Lighting Bench in Fig. 5.

Table III.—*Summary and Comparison of Illumination Values. Fig. 3.*

Lamp.	Positions.									
	1	2	3	4	5	6	7	8	9	10
A. .	2·0	1·48	1·07	0·851	0·667	0·537	0·443	0·363	0·305	0·247
B. .	19·85	18·6	16·5	11·2	8·35	5·95	4·42	3·21	2·43	1·855
C. .	1·855	2·43	3·21	4·42	5·95	8·35	11·2	16·5	18·6	19·85
Total calctd.	23·7	22·5	20·8	16·5	15·0	14·8	16·1	20·1	21·3	21·9
Obsvd.	20·3	19·6	15·9	14·2	13·2	14·2	15·1	18·0	21·0	21·0

The difference between the means of these two sets of values is less than 5 per cent. Reflection from the walls has very little to do with the result, nor has reflection from the dark bench in intensifying the light from the reflectors, though both of these effects may perhaps be masked by small differences in condition between the mantles used over the bench and those employed in getting the polar curve.

Table IV.—*Comparison of Values in Workshop Illumination. Fig. 3.*

Illumination in Foot-Candles.		Calculated.	Observed.
Bench A. Polar curve Fig. 6	Position 1	25·7	30
	,, 2	14·0	15
	,, 3	33·46	35
Bench B. Polar curve Fig. 7	Position 1	9·2	8·75
	,, 2	3·54	4·5
	,, 3	2·68	1·75
	,, 4	9·2	8·0
Bench C Polar curve Fig. 6	Position 1	16·6	20
	,, 2	16·9	11·5
	,, 3	16·9	14
Bench D Polar curve Fig. 6	Position 1	24·56	8
	,, 2	26·66	10
	,, 3	22·06	7

In another case of bench and lathe lighting by inverted mantle gas-burners, shown in fig. 5 and Table IV., the observations of

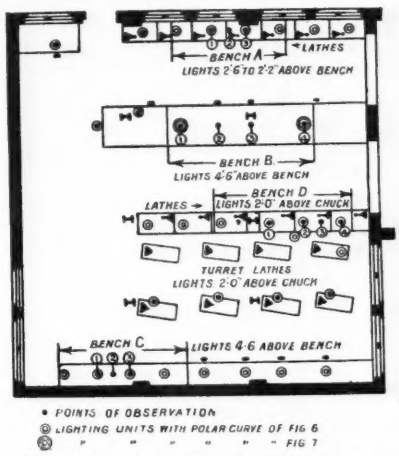


Fig. 5.—Plan of Lighting of Engineers' Shop.

illumination were taken under service conditions, with machinery running and people at work. Over bench A the agreement between calculations made from the polar curves shown in figs. 6 and 7 and observation is good; over benches B and C it is fair,

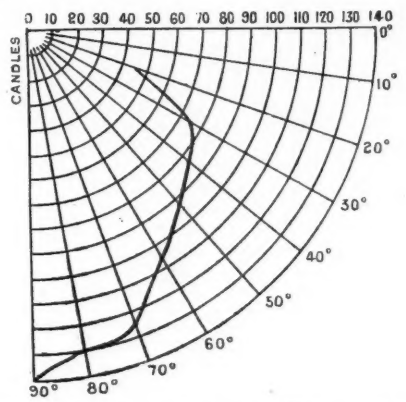


Fig. 6.—Polar Curve of Lamp and Fitting used over Benches A, C, and D in Fig. 5.

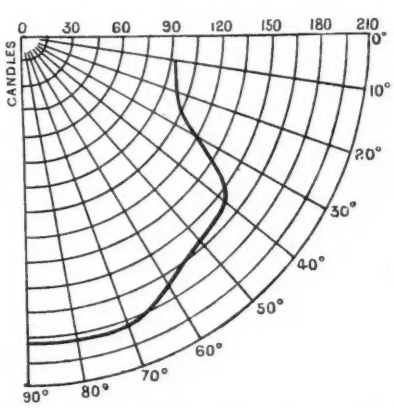


Fig. 7.—Polar Curve of Lamp and Fitting used over Bench B in Fig. 5.

and over bench D it is bad, due to mantles being out of condition. Bench D should get practically constant illumination of a high value if mantles are in good order.

Indirect Lighting in a Motor Car Show-Room.

We will briefly refer to the lighting of a motor-car show-room on a ground floor; the lighting points being for the indirect illumination of the floor 13 feet below. There are windows opening on to the street on two sides, and extending right up to the ceiling; while on the other two sides of the room there is a dark oak panelled dado to a height of 7½ feet from the floor, the other 5½ feet being a cream-coloured dado for one side and nearly all window glass to an inner office on the other.

An approximation to the horizontal illumination can be made as follows: Each unit consists of four 60-watt tungsten lamps mutually at right angles and placed horizontally within a bowl lined with ribbed mirror glass. Their depth within the bowl is such that no part of the lamp projects above the horizontal plane

of the top of the bowl. Assuming 0·65 mean spherical candle per watt and 240 watts per bowl, the mean spherical candle power per bowl is

$$0{\cdot}65 \times 240 = 156.$$

Eighty per cent. is given as the coefficient of reflection of the mirrors; and assuming that two-thirds of the total light is thus reflected, the effective mean spherical candle power is

$$\frac{176}{3} + 0{\cdot}8 \times \frac{2}{3}\ 156 = 135.$$

The total flux per unit in this case is

$$4\pi \times 135 = 1700 \text{ lumens.}$$

The total flux on the ceiling is 31,800 lumens. The area of ceiling is approximately 61 × 51 = 3110 sqare feet. Using Dr. Bloch's figure for the coefficient of reflection from the ceiling, 66·5 per cent., the reflected flux per square foot is

$$\frac{31800}{3110} \times \frac{2}{3} = 6{\cdot}68.$$

The observed value was 5·5 foot-candles in the centre of the room.

The author hopes that his illustrations may have helped to remove any doubt of the proposition that light for illumination purposes is capable of estimation and measurement, on an engineering basis.

DISCUSSION.

The Chairman (Mr. F. W. Goodenough), in inviting discussion, remarked upon the interest and value attaching to Professor Clinton's communication.

Mr. A. P. Trotter (London) observed that this was one of the first papers he had seen—certainly it was the first before the Society—giving calculations of illumination in which reflection played such a large part. In street lighting, which was a more elementary department of the subject, the point-to-point method sufficed, though Dr. Bloch used the lumen to obtain average lighting. In the case of street lighting, there was no reflection from ceilings, and the reflection from buildings was probably not worth taking into account. Although, however, the point-to-point calculation for such open spaces as streets was comparatively simple (it could be dealt with by the foot-candle), it was clear that, in cases of the kind treated upon in the paper, they must come to the lumen as the working quantity to be dealt with. He believed the lumen was going to be of great importance for the calculation of average mean illumination. He asked Professor Clinton whether he had found any difference in the vertical use of the Kennelly curve. It seemed to him that one might have cumulative error in building-up the curve from point-to-point. The lower part of it was comparatively unimportant in the sense that the light was falling upon a small area of the floor; but, as they crept up the hemisphere and got to the more important zones, if the drawing was not carefully made, they might get cumulative error as the curve was built up. It was obvious that the question of reflection played an important part, as they saw the difference between the calculated and the observed. But he asked Professor Clinton whether the reflection coefficient of which he spoke was the summation of the repeated reflectors, or whether it was the simple coefficient of the wall as a reflector. The labour of carrying out the calculations appeared at first to be rather serious; and they had not, so far as he saw, all the figures before them. The paper reflected extreme credit upon Professor Clinton, and showed the very satisfactory stage to which illuminating engineering had arrived.

Mr. Leon Gaster (London) having expressed his appreciation of the work Professor Clinton had put into the paper, and the care with which his calculations had been made, remarked that the author had preferred to go right back to first principles, and to work out the illumination from the polar curves of the lamps supplied. In order to make the estimations general and applicable to all systems of lighting, Professor Clinton had abstained from using "short cuts," such as the spacing rules supplied by various companies. All such methods were really based ultimately on the polar curve. Manufacturers, many of whom a few years ago scarcely knew what a polar curve meant, now habitually furnished the data concerning their own lamps. He (Mr. Gaster) therefore emphasized the importance of having such curves accurately and carefully determined, if possible, by an outside authority, so that there could be reliance upon their correctness. He also held that curves should be given both of the bare lamp, and of the lamp used with globe or reflector. The candle power in the various directions should also be marked on the diagram. It was most essential that all such particulars should be kept up to date. As new illuminants came along, the nature of the curves might be entirely altered. There were two data books issued in the United States; and these were from time to time brought up to date by issuing additional sheets. Nothing of the kind seemed to have been done in this country. In connection with the subject of factory and workshop lighting, a large number of measurements had lately been made of the actual illumination in such places; and he hoped these would be published, to show what was good and what was bad practice. He believed that the work Professor Clinton had done would be of very great value indeed. He had gone into this investigation in a very practical manner, by taking actual illumination, and showing how this existing illumination nearly corresponded with what was expected of it by calculation. With such near approximation, they might certainly depend upon it that they were not dealing merely with theoretical considerations. It was true the author had worked out his figures with great minuteness—more accurately perhaps than would be usually necessary in practice. In everyday life, for example, there were often cases in which all that was necessary was to make sure that the illumination provided was not less than that specified, and to allow an ample margin for depreciation, through wear of filaments and mantles, dirtiness of globes, &c. The essential point to be observed was that Professor Clinton had shown that not only could illumination be specified and produced with sufficient exactitude for commercial purposes, but if sufficient care were only taken to allow for the various factors, it could be predicted exactly. A distinction should be drawn between ordinary everyday installations and the occasional new and exceptional lighting problems which faced the lighting engineer. A man who had spent years in lighting a certain class of office, shop, or factory got to know with tolerable exactitude what the results would be; and his experience would often take the place of elaborate calculations. But in the highest class of illuminating lighting, in the lighting of fine buildings where special novel devices—diffusing glass ceilings, reflection from friezes, alcoves, mouldings, &c.—were used, and the engineer had to co-operate with the architect, the lighting engineer had frequently little past experience to go upon; and unless he could, by calculation, assure himself that the illumination when the job was finished would come up to the mark, he might make a failure of it.

Mr. J. Darch (Wandsworth Common) felt that too much reliance was being placed upon the actual illumination. What he meant was that the effect of the surroundings upon the eye had a very real effect on the individual appreciation of any particular quantity of illumination. The amount of light that actually came into the eye was of more importance than the actual amount of light that was measured. This was a point that appeared to be almost generally overlooked in speaking, as they did so much, about the photometer. They got out a scheme of illumination, and said they had so many foot-candles on any specified plane; but they quite overlooked the effect of dazzle and other things, which probably reduced 4 or 5 foot-candles to an effective 2 or 3 foot-candles. Photometrical results were, he maintained, far from being everything.

Mr. J. G. Clark (London) pointed out that one of the things the Society had done during the past year or so had been to specify minima values. They had had two Committees at work to try to reduce certain forms of lighting to something like an agreed basis. Certain minima having been specified, they required some means by which they could arrive at them by calculation or deduction; and Mr. Clinton had given them in his paper a nice step in the problem of practical illumination. For his (Mr. Clark's) own part, he found the flux method a very handy one to arrive at the average illumination. It was rather interesting to find—and he had no doubt Professor Clinton had found this himself—that, although they might have lighting units with quite different forms of shade giving quite different polar curves, yet the result and effect based upon the average illumination was remarkably similar. This was interesting to notice. He had come to regard the problem in two ways: First of all, they might ascertain the amount of energy either in gas or electricity providing the total flux based upon the average illumination; and the next problem was to arrange the units of light so that they had proper distribution of light—not a large quantity in one place, and a small quantity in another. Looking through some figures obtained from rooms having approximately the same walls, &c., but quite different units, with different polar curves, he found that the lumen efficiency based upon the mean illumination on the floor or working surface did not vary more than 15 per cent.—showing that the illumination efficiency based upon the average illumination was remarkably constant. In regard to arranging the units, the point-to-point method was probably the best for their purpose; but Professor Clinton had not mentioned the little Macbeth calculation, which afforded a very ready means of ascertaining the data which they had seen described that night as having been obtained by the point-to-point method. He had used this instrument a great deal. One reason probably why the efficiency did not vary was because they did not in many cases aim at throwing too much light on the walls. They liked to make the reflecting shades their reflecting surfaces; so this robbed the value of the walls. As Mr. Darch had mentioned, they preferred to get as much direct light from the agent as possible. Light from the wall was more or less direct, since it reached the eye without reaching the working surface. Some time ago he started collecting data from various installations—that was, he took a number of installations the data of which were known—the type of unit, the height and spacing, the coefficient reflection of the walls, and so on. He enumerated the data with the actual lighting efficiency obtained; and, as a result of this, he thought, if such work were generally continued, they might arrive at a sort of classification which might help in arranging installations. They might arrange the installations in Classes A, B, C, D, and so on; and give the means by which the results could be repeated from known data. If a collection on such lines were made, it would assist them very materially.

Mr. T. E. Ritchie (London) asked whether the coefficient of reflection that the author had given—66 per cent.—for the frieze might be taken for the ceiling—the ordinary white-washed one.

SATISFACTION! BUT NO FANCY PRICES.

ALL BRITISH MAKE—STANDARD SIZE. SPLENDID SELLING BURNERS.

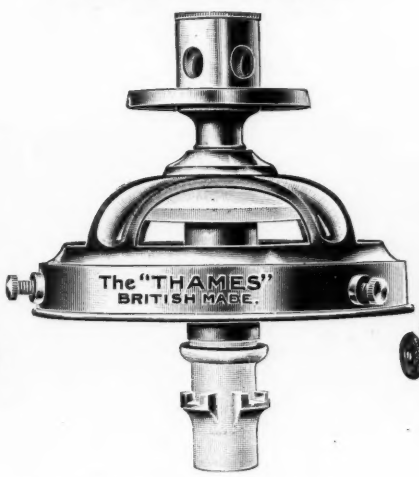
May we send you Samples to Compare?

The "GLASMI"

16706
Fitted with Gas and Air Regulators, with Non-Heat Conducting Handles, White Porcelain Heat-Deflector, and Fire-Clay Mantle Nozzle.

NOTE.—Globe screws are fitted into solid eyelets, not merely tapped into basket, obviating risk of globes falling and breaking.

The "THAMES"



21739
Fitted with Air Regulator, Porcelain Heat Deflector, and Fire-Clay Nozzle.
21740 With Gas Adjuster.

POLISHED BRASS, STEEL BRONZED, OR FLORENTINE BRONZED, SAME PRICE.

The "BRITON"

12839
Fitted with Gas and Air Regulators with Non-Heat Conducting Handles, White Porcelain Heat-Deflector, and Fire-Clay Mantle Nozzle.

The "ORIN"

13588
With Gas and Air Regulators, Non-Heat Conducting Handles, Porcelain Heat Deflector, and Fire-Clay Mantle Nozzle.

The "ALBION"

21515
With Gas and Air Regulators, Non-Heat Conducting Handles, Porcelain Heat Deflector, and Fire-Clay Mantle Nozzle.

The "SILVA"

15117
With Gas and Air Regulators, Non-Heat Conducting Handles, Porcelain Heat-Deflector, and Fire-Clay Mantle Nozzle.

Latest Price List upon Application.

Estd. 1839
And at 118, Howard Street, GLASGOW.

J&W.B.Smith

The British House, 15, 17, 19, 21 & 23, Farringdon Road,
LONDON.

Special Prices Quoted for Quantities.

ROBT. DEMPSTER & SONS LTD

TELPHERS

ELLAND. FOR ALL PURPOSES. YORKS

CARBURETTED WATER GAS.

ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LTD.

announces

REVOLUTIONARY IMPROVEMENTS.

13, Victoria Street, London, S.W.

GASHOLDERS, PURIFIERS, CONDENSERS, SCRUBBERS, SULPHATE PLANTS, TANKS, &c.

GET THEM AT

WALKER'S

MIDLAND IRON WORKS,
DONNINGTON, NEWPORT—SALOP.

London Office,
110, CANNON STREET, E.C.

While the calculation of these theoretical values was exceedingly interesting and important, it was perhaps still more important to be able to determine, with as great a measure of accuracy as might be, by what amounts these values must be reduced in practice; and this was a thing which was so extremely difficult, and an aspect of the question which calculation did so little to solve. If, therefore, Professor Clinton could give them any help in this direction, it would be of great value indeed to many of them. Mr. Gaster touched upon an important point when he referred to polar curves, and more especially when he touched upon the necessity for these polar curves, including the shade or fitting used with the lamp. It was perfectly clear that he was thinking of incandescent lamps; but the point might also be made that the polar curve of the arc lamp to be of the slightest value commercially must be taken with the glassware with which it was used. Another point Professor Clinton had referred to was the "ageing" of lamps; and he (Mr. Ritchie) would be glad if he would make it quite clear whether the expression "ageing" referred solely to the deterioration by age of the wall or ceiling surfaces, or whether in the figure given by him he had included a collection of dust and dirt of which such feature was made by the authority whom he had quoted [Dr. Bloch].

Mr. LOVIBOND asked whether Professor Clinton, in his calculated luminosities, meant the sum of the light impinging upon a given point, because, if so, he differed considerably from some little work he (Mr. Lovibond) had done on the subject. For instance, if one candle gave a unit of light on a given point 2 candles did not double it.

Mr. V. H. MACKINNEY (London), having given some information concerning the lighting of the Institution of Civil Engineers, said that, in the study of light, they seemed to reach a stage beyond which they exceeded the common-sense standpoint. Professor Clinton had shown them an indirect lighting installation in a motor-car show-room; but he (Mr. Mackinney) had never come across an indirect installation which gave the efficiency he mentioned. Further he could not appreciate fully the remarkable concurrence between the calculated and observed duties given by Professor Clinton. Perhaps there were certain data that he (Mr. Mackinney) had not fully realized. However, he felt that they should, as a duty to the lighting industry as a whole, thoroughly absorb the contents of this paper, and check it for themselves. One would like to know whether the actual candle power of the lamps, the voltage, the amount of dirt on the units, and the effect of the surroundings over which they had no control, were allowed for in plotting the curves between the observed and the calculated illuminations. When they had all these possible doubts in their minds—things they had come up against in practice—they were really staggered at the closeness between the observed and the calculated results. From the practical lighting engineer's point of view, there was one point that seemed to have been left out—that was "spacing ratios," which were now so useful in practice. Another valuable rule, which one could quite impartially apply to certain types of illumination, was the efficiency in terms of watts per burner or watts per foot-candle per square foot of floor area. For one class of illumination, one could for every ½ watt get 1 foot-candle on the horizontal plain; for another, it was 0·3; for another, 0·5; and for another, 0·75. These were figures one had instantly in mind, and they were figures which did tell them all they wanted nowadays. Another form of data which were extremely useful was to know in advance the efficiency not only of one point, but of various numbers of points of similar character. In connection with this, the Company with which he was associated had started tables which supplied the efficiency from 1 up to 64 points; and the amount of light got on to the working plane was something of the order of 60 per cent. The question of surroundings was of vital importance; and it was one which had been studied scarcely at all. He, at any rate, had seen little data in this country. One wanted data in connection with the size of rooms. One could have a small room and a large room with similar surroundings; but the effect on the horizontal plane was enormously different. Then one would also like to have some more data as to the absolute reflective power of surfaces.

Mr. WILLIS referred to an installation of indirect lighting with inverted arc lamps that he made two years ago in a large establishment in the Vauxhall Bridge Road. For the work, an average value of 3·5 foot-candles was taken on the working plane—3 ft. 3 in. from the floor. Photometrical tests were made after installation to see that they were getting this value. A week or so ago, he went back and took photometrical tests again; and the average was 3·207 foot-candles—the diversity coefficient being 2·3.

Mr. JUSTIN ESK had also been struck by the concordant results obtained from actual measurements and from calculations made based on certain polar curves. He should like to know if Professor Clinton had made any measurements to see if the lamps actually installed were giving the same polar curves and the same lighting effect. He was also particularly struck with the experiments as to the ageing effect. It seemed to him this was a most important point to consider here, because if they were going to have calculated installations which gave results that could only be held to be good at first, they would be misleading everybody, and losing their reputation.

Mr. J. S. Dow said he thought they must all agree that where calculations of this kind were difficult was when reflection from the walls and ceilings became a serious matter. Another thing that struck him very much was that in many of these calculations they nearly always had to make a kind of shot at the absolute reflective power of these things. Professor Clinton had done so much work of this kind that it would be of great value if he would give them really up-to-date data of the reflecting power of different materials. If Professor Clinton took up the suggestion, he (Mr. Dow) hoped he would deposit samples of the material with the Society for preservation. Of course, one might be tempted to ask why one should go through calculations in such an elaborate way as Professor Clinton had done—why one could not roughly rely upon (say) so many watts per square foot giving such and such foot-candles. Of course, one could not apply this sort of thing indiscriminately, because, for example, with indirect lighting in a narrow and high room a different result would be given than would be obtained from a room of the opposite characteristics. Of course, under different conditions, they could not apply these arbitrary rules so easily; and where the calculations came in was when they dealt with a branch of work where there was a blending of artistic and engineering elements. He believed in such cases the architect who erected a building and the man who was called in to light it should work together from the very designing of the place. The point raised by Mr. Gaster, as to the keeping of installations in good order and clean, was a very vital one.

Professor CLINTON, in the course of his reply, said he found the Kennelly curve easy to use. It could be constructed quite easily on the drawing-board; and the cumulative error was very small. He corroborated Mr. Gaster's remarks as to the value of polar curves; but he thought a summation curve should be shown as well. The Kennelly curve gave the summation of the whole flux up to any particular zone or all round the sphere. As to Mr. Clark's remarks, so long as the total flux was constant, it did not much matter how it was distributed, if one was only concerned with the mean horizontal illumination. Calculations by the point-to-point method were sometimes more valuable than the total flux method. He thought the suggestion as to the collection of data very good. With regard to the ageing, this might be divided into two distinct portions. There was the ageing of the wall surfaces and the ageing of the sources of light. With the arc lamp there was not so much ageing of the source; but there was always with the filament or incandescent lamps a distinct ageing. With the latter, therefore, they got the two effects—ageing of the surroundings and ageing of the lamps. As to Mr. Lovibond's remarks, it seemed clear to him (Professor Clinton) that, if they had two candles, and took one away, the light falling on a given point would be halved. Mr. Mackinney had thrown doubt upon the small differences shown between the calculated and the observed measurements. The variation of the elimination was of the same order whether they took it by observation or by calculation at the time the tests were made. He had only taken illumination values and not energy consumption. It was some surprise to himself that some of these things came out in this close way; and he checked the figures very carefully. As to the checking of the polar curve, he took the data supplied, and found they agreed very well with his own measurements. But in some cases the agreement was not so good as in others. He did not think that he could undertake an elaborate series of tests as suggested by Mr. Dow; the surfaces one used were essentially fugitive, and not permanent for preservation.

A hearty vote of thanks was passed to Professor Clinton, on the motion of Mr. GOODENOUGH.

Society of British Gas Industries.—In printing, in last week's issue (p. 819), the list of the office-bearers of the Society for the current year, the name of Mr. W. D. Helps was by inadvertence omitted from the list of Elective Members at present serving on the Council.

Westminster Technical Institute.—There is to be an exhibition of students' work at the Westminster Technical Institute, Vincent Square, S.W., next Friday, from 3 o'clock to 9.30, and a series of demonstrations by lecturers and students in all departments—including gas-fitting by the Gas Light and Coke Company's apprentices, gas-engine tests, gas-fitters' class work, and experiments on gas-fires, gas-lamps, &c. The Mayor of Westminster will address the students; and the very full programme contains a number of other attractive items.

The Law and Practice of Bankruptcy.—We have received from Mr. Effingham Wilson, of No. 54, Threadneedle Street, a book bearing the above title by Mr. G. L. Hardy, of the Inner Temple and the South-Eastern Circuit. The author states in his preface that he does not claim that his work deals with the whole law of bankruptcy. Its purpose is simply to supply practitioners of both branches of the legal profession, as well as the general public, with a convenient and inexpensive guide sufficient for all practical purposes. With this object in view, Acts of Parliament and bankruptcy and other rules have been treated with the utmost fulness; and, wherever possible, ample references have been given to the decided cases in support of the statements contained in the text. An attempt has been made to make the work as serviceable as possible by means of a copious index; and catch-words have been added in heavy type to facilitate reference. Preceding the text is a table of cases; and following it is an appendix, containing the rules framed under the Bankruptcy Acts from 1883 to 1913, those of the Supreme Court, and the rules in force under the Deeds of Arrangements Acts from 1887 to 1913. The price of the book is 2s. 6d. net.

THE RECONSTRUCTION OF A RETORT-HOUSE.

By Frank J. Pearce, of the North Middlesex Gas Company.

[A Paper read before the London and Southern Junior Gas Association, Friday, March 27.]

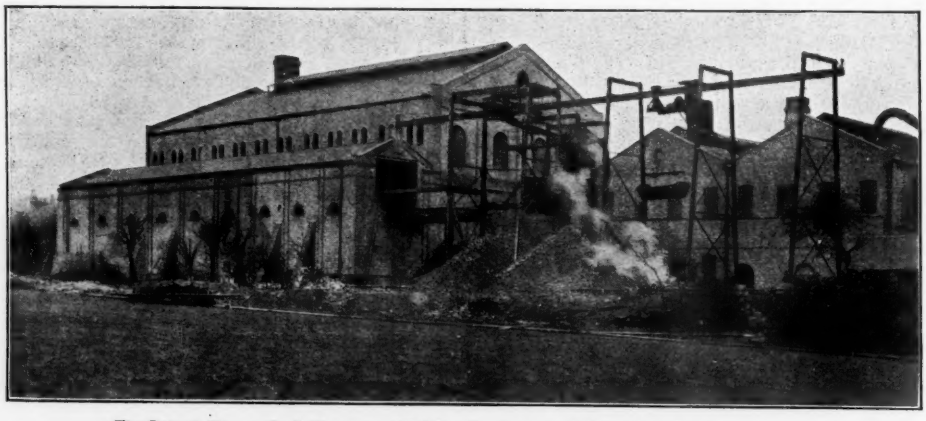
The district supplied by the North Middlesex Gas Company is a large and rapidly developing one; and it became necessary that immediate steps should be taken towards materially augmenting the output capacity of the works, in order to keep pace with an ever-increasing demand for gas. Under these conditions, attention was naturally drawn to the retort-house; and the Directors determined upon immediately taking in hand the task of providing a new house. At the time this was decided upon, the only available site was that occupied by the existing retort-house. The question therefore resolved itself into one of remodelling the old retort-house and bringing it into a thoroughly up-to-date condition, thereby increasing the gas-making capacity.

In dealing with this subject, I propose first of all to give you a brief description of the old house; secondly, a description of the new house, embodying the reconstruction; and, thirdly, some comparisons of the gas-making capacity of the old and new houses, together with details of the labour required in each case.

The Old Retort-House.

The dimensions of the building inside the walls were as follows: Total length, measured down the centre of the house, as the house is not rectangular, one side being longer than the other, 112 feet; total width inside walls, 56 feet; height from ground floor to springing of roof, 28 ft. 6 in. It will be seen that the total area covered amounts to 6272 feet super.

The house contained nine beds of seven and one of six 20-feet through retorts, 21 in. by 16 in., direct-fired and shovel charged.



The Retort-House, Coal-Stores, and Telpher Track at the Mill Hill (Hendon) Gas-Works.

The beds were provided with separate hydraulic mains each side, there being two 5-inch ascension pipes to each retort. But latterly the hydraulic mains on one side were fitted with anti-dips and worked as dry mains; the mains on the other side of the house being thrown out of use. The gas was taken from the house by a 12-inch foul main, governed by an 8-inch retort-house governor. The retorts were charged every six hours; the weight of coal placed in each through retort being 5 cwt.

The New House.

The house, as remodelled, contains nine settings of ten 24 in. by 16 in. by 20 ft. through retorts fired by regenerative furnaces. The bench is provided each side with a separate hydraulic main to each bed; there being one 7-inch ascension pipe to each retort, with the exception of the two top retorts, which are provided with a pipe at each end. Each hydraulic main is connected by means of an 8-inch gas take-off pipe to an 18-inch steel foul main running the full length of the bench, and fitted at one end with the 8-inch governor from the old house, and at the other end with a new 12-inch retort-house governor.

The foul main is provided with a valve placed between the gas connections from the Nos. 4 and 5 beds, so that the house can be worked in two sections, each consisting of four and five beds respectively. The outlets from the two governors are, however, both connected; and the gas from both sections would leave the house through one 18-inch main.

The hydraulic mains are of a special shape; being 6 inches deeper in the centre than at the ends, so that all heavy tar will drain automatically towards this point. They are connected with 4-inch valves, &c., to a 6-inch tar-main leading to tar-towers placed at each end of the bench. There are four of these towers, two at each end of the house, so that each section may be worked entirely independently of the other. The seals are regulated by weir-valves on the overflow from the towers.

The liquor, which is continually overflowing, is not allowed to run away direct to the tar and liquor well, but flows into a small tank fixed on the end wall of the retort-house. From here it is pumped into a large covered tank placed well above the level of the hydraulic mains on the top of the bench, which is used for flushing the mains and also for supplying a continual liquor feed; it having been found beneficial to keep a small quantity of liquor running into the hydraulics the whole time. The pump delivery is fitted with a four-way piece, with a cock on three of the branches. Two of these branches supply pipes running along each side of the bench and connected into each tar take-off pipe just below the valve; each connection being fitted with a cock. The third branch supplies the large tank.

With this arrangement, should the tar-main or any of the tar take-off pipes at any time show signs of becoming blocked with thick tar, it is an easy matter, by shutting the cock on the delivery of the tank, and opening one or other of the cocks on the branches, to pump liquor direct through the main, and thus clear it; and by manipulating the tar-valves on the hydraulics it is also easily possible to pump back through any one of the tar take-offs into the main, should any stoppage be suspected in the take-off pipe or valve itself. By circulating the liquor in this way, and not allowing it to flow away to the liquor well, it gains very considerably in strength, and, what I think you will agree is more important still, it also prevents a continual stream of warm, weak liquor running into the well all the time. The value of the whole arrangement has already been proved.

To return now to the method of handling the coal, charging the retorts, and removing the coke.

Coal Handling.

The coal is brought into the stores, which run the whole length of one side of the house, in railway waggons running on an elevated railway, and tipped direct into a hopper feeding a breaker. The coal then passes through an adjustable door in the hopper on to a jigger screen, which feeds the large lumps into the breaker—all the small coal falling direct into the boot of an elevator of the ordinary bucket type. This elevator discharges the coal on to a conveyor of the push-plate type, which supplies storage bunkers running the full length of the bench, and capable of holding twenty-four hours' supply.

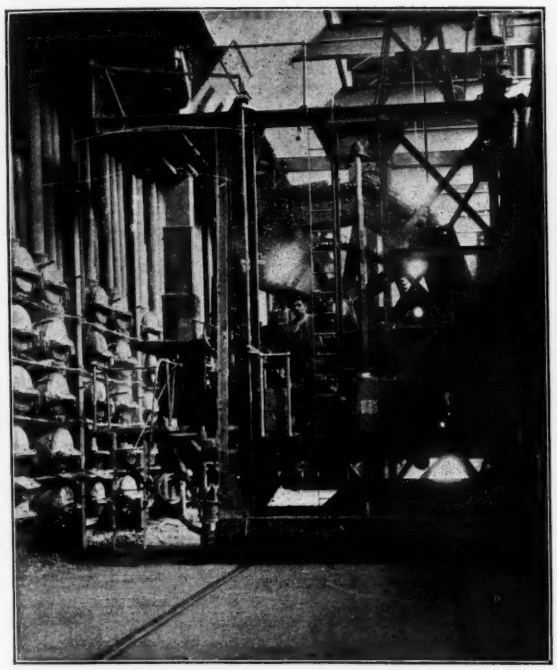
Retort Charging.

The retorts are charged by means of a Fiddes-Aldridge simultaneous charging-discharging machine, which takes its charge of coal from the bunkers as it traverses the house; the hopper doors being operated by means of steel pins on the machine itself. The weight of coal placed in each retort is regulated by means of an adjustable measuring chamber.

Coke Handling.

The hot coke is removed from the house by means of a telpher. The skips are placed on the stage floor close to the front of the settings, and the burnt-off charge pushed out. Each skip takes two charges. The coke is partially quenched in the house by means of water supplied through hose pipe. The skip is then hoisted up, taken outside the house, and lowered into a tank containing water, which completes the quenching. The coke is then tipped on to the heap, and the machine returns to the house for the next load.

In order to save time, it is found necessary to use two or even more skips, as otherwise the stokers would have to await the return of the telpher before they could proceed to charge the next pair of retorts. Thus, supposing six beds are under fire, the order of charging would be as follows, two, four, six, one, three, five. By working in this way while the telpher is taking the skipful of coke from No. 2 bed, No. 4 bed is being charged, and the other skip is brought in and dropped ready for No. 1 bed, and similarly with the others—thus not only saving time, but rendering the handling of the skips much more easy than if two had to be placed side by side, in which case the ends are likely to foul one another. There is also an extension of the telpher track to enable the machine to be used for loading coke-trucks. The



The Fiddes-Aldridge Stoker.

waggons are pushed through the coal-store and out at the end on to a gantry. The coke is forked into the skip, which is then hoisted up and placed over the truck and tipped. It takes about five skipfuls of coke to load an ordinary sized railway waggon.

The whole of the plant of the new installation is electrically driven; power being supplied by 45 KW. compound wound dynamos generating direct current at 220 volts, and driven by high-speed compound reciprocating steam-engines, both in duplicate.

Reconstruction.

In reconstructing this house the first part of the work to be taken in hand was the raising of the roof for a height of 16 ft. 6 in., in order to make room for the settings of increased height, with their superincumbent mains and connections and coal-handling plant. This was commenced at the beginning of October, 1912, and completed early in 1913. It was originally intended to divide the existing roof into two halves, and to raise one half at a time, without disturbing the slates, purlins, &c. Upon careful examination, however, it was found that many of the purlins and slates were in a bad condition and would require renewing. It therefore became necessary to remove the slates, which, in these circumstances, was done before lifting was commenced. Otherwise the raising of the roof was carried out as originally arranged.

Method of Raising the Roof.

The method adopted was as follows: At the lower ends of each principal, just over the shoe, holes were drilled and a steel bracket bolted on; so that the tops of these brackets were in line and perfectly level along each side of the roof. Steel joists, 8 in. by 6 in., were then securely bolted on to the brackets, so that there was a continuous line of joists along each side. These girders in position, everything was then in readiness to commence lifting. This was effected by placing 10-ton hydraulic jacks, of special short construction, under the joists within a few feet of each principal, by which means the whole portion of the roof could be raised about 12 or 15 inches at a time.

As soon as the lifting had been accomplished, the bricklayers were set to work to build up the walls, in bricks set in cement, under each shoe. The roof was then lowered on to the piers so formed, the jacks removed, and the walls between the principals completed, after which the jacks were placed in position for raising the roof a further distance, and the same operations repeated until the whole roof had been lifted to the desired height.

While this work was being carried out, a temporary roof, consisting of tarpaulins fastened on to a framework of scaffold poles, was erected over each working floor, so as to protect the stokers from the effects of the weather.

First Section of the New Retort-Bench.

The work of erecting the new bench was commenced on March 1, 1913, and on that date the Company handed over to the contractors five of the old beds for dismantling and clearing the site. As soon as the brickwork of the fifth bed had been pulled down, some of the old buckstays were placed in position against the outside wall of the remaining five settings, four of which were at work, the tie-rods shortened, fitted with straps, and bolted up, so as to render the working of the remaining beds quite safe.

The site having been cleared of all old brickwork, it was found that the existing concrete foundation, which had been in use for a great number of years, had been so badly affected by the heat that it was totally unsuitable for carrying the greater weight of the proposed beds of tens, with their accompanying coal-bunkers, &c. This was therefore excavated to a depth of 5 feet, a bed of cement concrete laid, reinforced with steel flange rails; and upon this foundation the first section of four beds with the chimney was built.

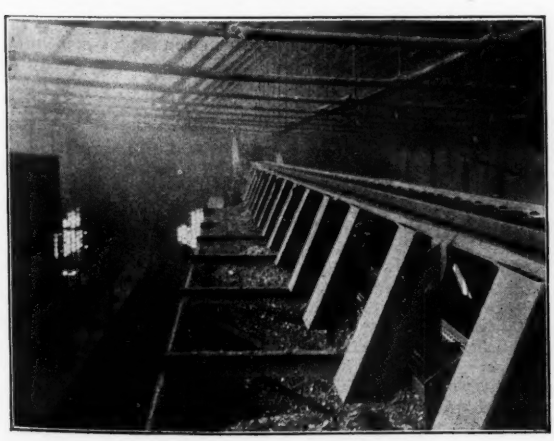
As soon as the arches were completed, temporary buckstays were fixed in such a position that they cleared those of the old settings, and the four beds tied in so that they could be worked while the second section was being built. The end buckstays of the bench are four in number, each consisting of two 46 lb. rolled steel joists, 14 in. by 6 in. These are provided at the lower ends with heavy cast-iron boxes, well bedded into the concrete foundation, so as to protect them from corrosion. The tie-rods are 2½ inches diameter, with coupling screws, and are provided at each end with strong spiral steel springs so as to allow for expansion.

The division wall buckstays on the charging side are of 55 lb. rolled steel joists, 18 in. by 6 in., and form the supports for one end of the coal-bunkers. Brackets are also bolted on to carry the stage floor. These brackets, as also the tops of the girders, are fitted with roller bearings to provide against expansion.

The buckstays on the discharging side are of 46 lb. rolled steel joists, 14 in. by 6 in. Every alternate buckstay is lengthened, and so forms the support for one end of the cross joist carrying the telpher track. The cross ties are formed of 42 lb. rolled steel joists, 10 in. by 6 in., and support the hydraulic and foul mains. The stage floor on each side is formed of rolled steel joist main members covered with reinforced concrete and paved with blue chequer bricks.

Breaker Pit.

While this work was being carried out, the breaker pit was being constructed in one of the bays of the existing coal-store. The pit is constructed of cast-iron flanged plates; and it was necessary to excavate to a depth of about 20 feet. As the pit had to be constructed close to the west wall of the retort-house, which, in addition to its own weight, supported part of the roof, the stage floor on the charging side, and the overhead railway, it was necessary to underpin the piers which might be affected by the excavation. While the underpinning was being carried out, the piers had to be supported by needling; and the buckstays from the old bench were used for this purpose. Holes were cut in the base of each pier about 12 inches above the floor, the needling put in position, and packed-off baulks of timber at each end. The whole weight being thus taken off the foundations, the excavations were carried down about 2 to 3 feet below the bottom of the pit, and piers, in blue



Conveyor and Coal-Bunkers.

Coal Bunkers and Flushing Pipes.

bricks set in cement, were built up until they met the bottoms of the existing piers.

This having been completed, the needling and packing were removed and the excavation for the pit carried out without any danger of settlement of the adjacent wall. On completion of the excavation, the bottom cast-iron plates were laid on a bed of concrete and grouted-in, followed by the side plates; sufficient timbering being removed to allow of one row of plates at a time being fixed. As each row was completed, the intervening space between the plate and side of the excavation, about 9 inches, was filled in solid with concrete. The top of the pit, with the exception of the portion occupied by the hopper, was covered with chequered steel plates supported by rolled steel joists, after the breaker and boot of the elevator had been fixed in position.

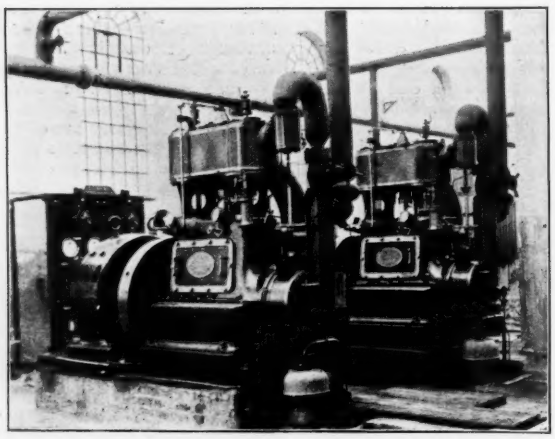
Elevator, Conveyor, and Coal-Bunkers.

These are of the ordinary type usually met with in installations of this kind; and I think it would be superfluous for me to take up your time with a description of them here. The coal plant is capable of handling 25 tons per hour.

The erection of the first section of the new installation, complete with the coal and coke handling plant, was finished about the end of June last.

Second Section of the Retort-House.

Three beds were immediately put into action; and after about a fortnight's working, everything being then in order, the Company handed over the remaining five beds of the old bench to the contractors for dismantling. The work of completing the new bench was immediately proceeded with on the same lines as the first section. The arches were built; holes being left in No. 5 arch to allow of the withdrawal of the temporary buckstays. The two end beds were completed and the next two partially so; and by this time the permanent end buckstays were fixed in position.



Power Generating Plant.

The temporary buckstays were now withdrawn one by one, by being hoisted up through the top of the arch, and the tie-rods coupled up the whole length of the bench. The work of setting No. 5 bed was carried out with all speed, so as to enable No. 4 bed to be put to work. The whole installation was completed about the end of January last.

Comparison of Old and New Houses.

I now come to the portion of my paper dealing with the working of the two houses, and will first of all compare them as regards gas-making capacity and labour. The old house, as previously mentioned, contained nine beds of seven and one of six through retorts, and was capable of producing, in round figures, 770,000 cubic feet of gas per day, on a ground area of 6272 feet super. In order to work the full number of beds, 28 men, including firemen, were required. The production of gas was therefore 27,500 cubic feet per man per day. The stokers had to wheel their own coal from the stores.

The total amount of coal carbonized during the half year to June 30, 1913, was 6087 tons, producing 71,244,100 cubic feet of gas, corrected, equivalent to a yield of 11,700 cubic feet per ton of coal. Taking this result as a basis, with the whole house at work the total quantity of coal used would be 66 tons per day, equivalent to 2·36 tons per man. These settings were all on six-hour work; and from the figures given the quantity of gas produced per mouthpiece was between 5500 and 5600 cubic feet.

To come, now, to the new settings. The results obtained up to the present show that a safe figure for the make of gas per retort is 20,000 cubic feet per day; so it will be seen that the gas-producing capacity of the remodelled house is 1,800,000 cubic feet per day, or 133 per cent. more than the old house. This large increase is obtainable on exactly the same ground space as was previously occupied. The retorts are charged every eight hours, except the bottom retorts, which are on twelve-hour work. The average weight of coal per charge is 10¼ cwt.; and the make of gas comes out at 14,000 cubic feet per ton—showing an increase of 2300 feet per ton over the make with the old settings.

In view of this large increase, the question very naturally presents itself, What about the illuminating and calorific values of the gases produced in each case? And, further, Is the coal the same? With regard to the latter question, the coal used during each of the periods of comparison was practically the same; so much so that I cannot account for any increase in make due to any changed conditions here. As regards illuminating and calorific values, the following figures will, I think, dispel any idea that the improved results have been obtained at the expense of the quality of the gas.

	Average Ill. Power.		Average Calorific Power.
Jan. to June, 1913, old settings . .	13·72	No. 2	565 B.Th.U. gross 514 ,, net
Oct. 1913, to Feb., 1914, new settings	13·17	No. 2	539 B.Th.U. gross 483 ,, net

These figures show a loss of 0·55 candle and 26 B.Th.U. on the gross calorific value; and I cannot think it will be argued that this small loss is sufficient to account for an increase in make of 2400 cubic feet per ton of coal. I might further add that these figures are the averages of the daily tests made during each period. The tests were in each case made upon a sample of coal gas collected in a small holder during a period of four to six hours; so that they can be taken as being actually representative of the quality of gas made.

With regard to the number of men required for working the house, we have not yet felt the full benefit of the new conditions; seeing that during this winter only four of the new beds have been required. To work this number, the following men have been employed: Two machine drivers, two telpher drivers, four stokers, one fireman, one pipe man, and two coal men—total, twelve men per day. The production of gas per man is therefore about 67,000 cubic feet per day; and I see no reason why this figure should not be increased to 100,000 to 120,000 when the whole house is at work.

The quantity of coal used per day with the four beds at work is about 57 tons, which works out at 4·75 tons per man per day. This also would automatically increase with a larger number of beds at work. With the present number of beds working, however, it will be seen that the labour charges have been very substantially reduced; the production of 67,000 cubic feet of gas per man per day comparing very favourably with 27,500 cubic feet production under the old conditions.

Another item of great importance, and one in which large saving has been effected, is fuel. Dealing first of all with the old setting and comparing the same period—viz., January to June, 1913—the total coal carbonized was 6087 tons and coke produced 3869 tons. Of the latter, 2926 tons were sold and the balance (943 tons, equal to 24·4 per cent. of the total made) was used as fuel. On another basis of comparison, the fuel amounted to 15·5 lbs. of coke per 100 lbs. of coal carbonized. With the new settings, and taking the same period for comparison—October, 1913, to February, 1914—the total coal carbonized was 8051 tons, and the coke produced was 5233 tons. Of this, 4417 tons were sold, and the balance of 816 tons, equal to 15·6 per cent. of the total made, used as fuel. This works out at 10·1 lbs. of coke per 100 lbs. of coal carbonized.

It will therefore be seen that the additional quantity of coke available for sale amounts to practically 9 per cent. of the total quantity made. I have every reason to believe that the present half-year's working will show even greater saving in this respect than the period taken here for purposes of comparison.

DISCUSSION.

The President (Mr. S. A. Carpenter, of the North Middlesex Gas Company), in introducing the author, said it was a great pleasure to him personally to have got Mr. Pearce there to read the paper. It had been a hard task to persuade him, because his time had been much taken up in connection with the new retort-house. As originally intended, the paper was to precede the visit of the members to the Mill Hill works; but he thought that coming afterwards it would be even more interesting, because those who had inspected the house would have in mind the apparatus which was about to be described. Under any circumstances, the preparing of a retort-house for equipment with machinery was a difficult matter; but this was specially so when it was a question of re-constructing an old retort-house, and maintaining the operation of gas making during the whole of the time. On discussion being invited by him after the reading of the paper,

Mr. D. J. Winslow (Lea Bridge) remarked that the results obtained, as shown by the paper, were excellent. The gas-making capacity of the new house was 2½ times what it was before, on the same ground space; and the labour costs were very much less—which was what one would expect from a house of this type. A make of 14,000 cubic feet per ton, as against 11,700 feet with the old hand-stoked house, was very good indeed. It used generally to be considered that in a hand-worked house the make of gas per ton was comparatively good; for the men had a chance of seeing that the whole of the coal was thoroughly carbonized, and in consequence could secure good results. He was, of course, speaking of six-hour charges. Therefore, when they obtained 14,000 cubic feet per ton, and the calorific value and candle power were practically the same, it made them wonder for a moment where the increased gas was coming from. He would have liked to have

heard some further suggestions as to how the additional gas made could be accounted for. No doubt there would be a saving of gas in the process of charging the retorts; but this would not fully explain the difference. In relation to the make of gas per ton, it would be interesting to hear what was the make of tar and ammoniacal liquor, and also to have an analysis of the tar. How had the men displaced by the machinery been disposed of? Had it been possible to put them all to other work? The North Middlesex Gas Company were to be congratulated upon the judicious management which had secured these results.

Mr. E. G. Stewart (Fulham), referring to the method of dealing with the liquor, remarked that he himself had had a good deal of experience in different retort-houses; and certainly there was nothing like putting plenty of liquor over hydraulic mains to keep them free. The author used the same liquor over and over again; but did he not in this way lose a good deal of the ammonia? He knew of one retort-house where they pumped a great deal of liquor as described; and they had to use a cooler of considerable size to keep the temperature down below 100°. Where he was at present they ran the liquor from the hydraulic main to the well; but they had to put it through a cooler *en route*, as otherwise the temperature of the well went up, especially in the summer. In view of the high make, he would like to ask what depth of seal the author used. He had studied this particular charging machine during the past few years, and had noticed a good many points about it. Did Mr. Pearce have any trouble through the machine pulling-back the coal? Though it was a very excellent machine, it had a few disadvantages; and one of them that he had noticed was that, when working heavy charges, a certain amount of coal was pulled-back. Undoubtedly with this machine the personal element entered to a certain extent into the placing of the charge. If the drivers were not up to their work, one got some amount of coal on the mouthpieces which was not burnt off; and if this matter was not looked after, it might easily account for 100 cubic feet per ton. Was any particular design of shoot used for charging the furnaces? With reference to the telpher, it seemed to him that, in dodging about from one bed to another in the way described, there was danger of the driver omitting to drop the pins. When running straight up and down the retort-house, there was not much chance of such a mistake being made. Was the temperature of his retorts practically the same up against the iron of the mouthpiece as it was in the centre of the retort? If so, how did he do it? When he had four beds working at a time, out of nine, was there any difficulty with the expansion of the beds affecting the height of the bunker?

Mr. G. M. Gill (Wapping), on being called upon by the President, remarked that the arrangement of the author for dealing with the liquor by using two tanks one above the other, and pumping through the tar take-offs, was excellent in many ways. It had been in use at Wapping for the last four years; and there was no doubt that working in this way, it was possible to keep all the pipes and the hydraulic mains quite clear. Also by circulating the liquor over and over again one could keep one's main storage tank quite cool. Mr. Stewart had referred to this point; and there was no doubt that, unless care was taken, one could get the storage tank very hot indeed. But if the same liquor was circulated over and over again, and only the actual make was allowed to run away to the well, the storage well was kept quite cool without putting in any cooler at all. At any rate, at Wapping there were no arrangements for cooling the liquor; and the storage tank was perfectly cool. The idea of the pump saved a tremendous lot of poking about the hydraulic mains with iron rods, and work of this description, which it was necessary to do in the olden days. He thought this arrangement had a very great deal to do with the big make the author spoke of. With reference to the coke being taken out by the telpher system, he would like to ask whether, in dropping the telpher skip into the water-tank, the coke was soaked, or whether it was just properly quenched. It was a very convenient plan; but he had heard it criticized, though he had had no experience of it himself. Why did the author use steam-engines instead of gas-engines for generating electric current? The method of raising the roof was ingenious; and they would all have made a mental note of it. With reference to the breaker-pit, he assumed that the whole of it was constructed with cast-iron plates, and that this was done with a view to keeping out the water.

Mr. Pearce: That is so.

Mr. Gill (continuing) said that at his works they recently had an elevator pit to construct; and on going into the question of cost, they found that to make it of cast-iron plates would prove very expensive. Rather than incur this expense, therefore, they built the pit with two 4½-inch blue brick walls, with 1½-inch space between, into which they ran pitch. This made the pit perfectly water-tight at a much lower cost than could have been done with cast-iron plates. The pit had been in use for some considerable time now; and it was absolutely dry. The kind of pit they made would come to only about £5; whereas with cast-iron plates the cost of the plates alone would have been some £60. The results Mr. Pearce spoke of were excellent, and would be hard to beat. It was rather interesting to note that these results were being obtained with eight-hour charges, because generally speaking he thought a twelve-hour charge would give better results than an eight-hour one, as regards make of gas per ton. He noticed that the coke made for sale worked out at 11 cwt. per ton of coal.

Mr. W. A. Vanner (Walton-on-Thames) said he was struck by the length of time the old direct-fired settings had been retained, considering that they were such large fuel consumers. What was the make of regenerator in the new house; and had the author found with these settings any trouble from stopped ascension-pipes? If not, to what did he attribute the fact? With the old direct-fired furnaces, the heat was, of course, much less. He would like to know what the seal was under the old conditions. No mention was made of the quantity of tar and liquor in the old house, and that now recovered. This point was referred to by Mr. Winslow; and it must have a big bearing on the increase in the make. With reference to the point of whether, by pumping liquor into the hydraulic main, it would lose its ammonia through being warmed up, he might say that he had had a little experience of pumping from an ordinary storage well. It was found that, instead of warming, it had a tendency to cause the tar in the hydraulic to set, so that it was necessary to introduce steam to make it run from the bottom of the hydraulic. What was the vacuum on the inlet of the exhauster under the old arrangement and the present one; and what vacuum was there on the inlet side of the retort-house governor?

Mr. G. F. Cox (Commercial Gas Company) pointed out that the coke was practically quenched twice over—by the hose-pipes and then in the tank; and he asked whether the author had any figures to show the amount of water taken up by the coke. As to providing the tie-rods with strong steel spiral springs to allow for expansion, he was rather of opinion that the temper of these springs would soon deteriorate in the retort-house. Was there any method of renewing them? He was under the impression that for a retort-stack to be well braced was half the battle; and if they were going to allow a certain amount of expansion at this spot, it was rather risky.

Mr. C. T. Price (Hampton Court) said there was one point on which he was rather doubtful. The author said that by continual circulation of the liquor from an overhead tank to the hyraulics, the liquor was increased in strength very considerably. He would have thought that the temperature to which it was exposed would to a certain extent prevent the combination of more ammonia. Taking the average strength of liquor from the tar tower at 60° Fahr. as 4 oz., could Mr. Pearce give them some idea of the maximum strength he obtained? It was certainly a distinct advantage not to have a continual stream of warm liquor running into the well. The roller bearings to the brackets on the buckstays on the charging side seemed to be a novel idea, but he should have thought that the covering of reinforced concrete, with blue chequer bricks, would have been a good lagging, and have prevented any undue expansion. It was interesting to note that anti-dips had been discarded in favour of a liquor seal. Could the author give the specific gravity of the tar, both with the old light charges and the present heavy ones?

Mr. Cox: The raising of the roof was effected by means of hydraulic jacks. How many jacks were there?

Mr. Pearce: One 10-ton jack to each principal; so that there would be six jacks in a row.

Mr. A. R. Griggs (South Suburban Company) said it struck him that the calorific power of the gas, for 13 candles, at 483 B.Th.U. net, was rather high. He would not have expected more than 460 B.Th.U. Had the author any special method of dealing with the gas after it left the retort-house? With reference to the average weight of charge, did this mean the average weight for eight-hour charges, or including the twelve-hour charges? One could not really compare a big retort-house with a small one; but the amount of coal carbonized per man he had been comparing with one of the houses at his works which contained 26 settings. It came to about 12 tons per man working on for eight hours. He believed the author worked on twelve-hour shifts; and if they were doing the same at his own works, it would make the amount about 16 tons per man. Mr. Pearce was to be congratulated on the way in which he had carried out his reconstructional work, while continuing the process of gas making.

Mr. W. E. Brown (Gas Light and Coke Company) remarked that he also had been struck with the point mentioned by Mr. Vanner—that was as to why direct-fired furnaces and the barrow and shovel had been retained so long.

The President remarked that the good discussion which had taken place showed that the paper had appealed to those interested in retort-house practice. A point striking him was with regard to the extension of the telpher track to enable the machine to be used for loading coke-trucks. He was wondering whether it would be possible, instead of first dropping the coke in the yard and then picking it up again, to take it direct from the retort-house to the truck, and so save making two operations of it, and also the loss which must take place owing to the formation of breeze. The raising of the roof was a fascinating process. Nowadays, when coal was so dear, it was more than ever important to secure the highest possible make of gas; and an increase of 2300 cubic feet per ton made a very appreciable difference in the cost of gas manufacture. Reference was also made in the paper to the reduction in labour, which was another important item in the cost of production. Though there were fewer men employed on the retorts now, he did not think any had been dealt with in an unjust way.

Mr. Pearce, in reply, said one of the points raised was with regard to where the increased make came from. Well, first of all he thought they had to take into consideration the more perfect carbonization. The heats were greater, and care was taken that all the coal which went into the retorts was properly carbonized and every foot of gas was extracted from it. While it was not

possible to allocate the actual increase due to each particular cause, undoubtedly a very large proportion of the gain arose from the fact that the retort-lids were shut directly the charging was completed. When charging by hand, the door was open for several minutes; and as soon as the first shovelful of coal was put in gas began to be made and wasted. There were, too, men who, when they had finished charging a retort with a shovel, did not always get the door shut as quickly as they might. He had not with him figures as to the tar and ammoniacal liquor made; but for ammonia, at any rate, they did not pretend that the figure per ton of coal was as high as it was with the old settings and low heats. Members would recognize that this would not be possible. They had dealt fairly with the men displaced; most of them having gone to the yard. Generally speaking, jobs were found for those who were content to take them. Mr. Stewart and Mr. Price had gone further into the question of ammoniacal liquor; and the points had been raised as to whether any ammonia was lost and what was the temperature of the liquor. He found no difficulty in keeping the temperature in the circulating tank down to a fairly normal level. He did not mean to say that the liquor was tested for temperature every day; but they knew what the temperature was. It was all boxed up, too. The big and the smaller tanks were covered; so that very little could escape. As regarded strength, they had had samples tested from the big tank; and they proved to be well over 10 oz. liquor. They worked with about ½-inch depth of seal. In the old retort-house there was a dry main. This was in use when he first went there; and he did not know what seal was employed before that time. Several interesting points with regard to the charging machine had been raised by Mr. Stewart. First he asked whether the machine pulled back the coal. It did, but they got over the difficulty. They had found great benefit from taking out the next push-plate to the front one. This was only done a few days ago; but it had already been proved to be an advantage. The plate was taken out for experimental purposes; and it was going to remain out. Certainly the personal element came into play to a great extent with these machines; but since they had had two good drivers on the machine there had been no trouble whatever. It worked beautifully. The drivers were encouraged to use their judgment a little, and to place the charge nicely in the retort, right off the ironwork. If any coal remained on the ironwork, it was not properly carbonized, and there was danger of it getting into the skip; and if it found its way to the coke-heap, trouble arose. For charging the furnaces they had a large shoot, wide enough to take two retorts. As to the method of dodging the beds in charging, working two, four, six, one, three, five, they found this was absolutely necessary, because the skips were just long enough to foul each other, if one was placed opposite No. 1 and another opposite No. 2. No trouble had occurred through working in the way he had described. The driver might have had some coal down on him once or twice; but if so, it had certainly improved his memory, for there had been no difficulty lately. The temperature of the retorts was kept very even through the whole of their length. There were means in the settings for adjusting in such a way that they could regulate the secondary air to the middle and also the outside of the setting. This had a great deal to do with the matter. So far as he knew, the height of the bunkers had not been affected by any undue expansion through using four beds out of nine. Mr. Cox had asked about the spiral steel springs to the tie-rods. These springs were very short; and they were simply put there because one could not prevent the bed expanding however much one bound it up. The springs allowed this expansion to be controlled. They did not get really hot, because they were a considerable height above the beds, and right on the outside of the end walls. With regard to the queries about the coke being soaked, he might say that with the telpher they had to pay great attention to the quenching. First this was partially done in the house by means of hose-pipes; and then the coke was thoroughly quenched in the tank. It would not be necessary to quench it so much if the telpher was longer, and they could tip the skips in different places, and spread the coke out. They had, however, to tip all their coke practically in the same place, so that if a load of hot coke came out of the skip it would get buried by another, and there would be danger of fire. In their case, the coke did get somewhat soaked, because they had to quench it so thoroughly. He had heard of works where they dipped the skip about a foot, and the steam quenched the coke; but from his own experience he found this difficult to understand. The cast-iron plates for the breaker-pit were certainly expensive; but they were put in because a lot of water was expected. The question as to why direct-fired furnaces were retained so long was an historical one; and he could not then give an answer to it. They had very little trouble from stopped pipes, because they looked after them well. The vacuum on the inlet to the exhauster was about 3 inches. Of course, with a retort-house governor one could afford to pull. They had ½-inch seals, and kept the vacuum on the inlet of the governor at about 10-10ths, so that the gas was not in any way bottled-up in the mains or retorts. He could not give them any figures as to the percentage of water present in the coke; and the same remark applied to the difference in specific gravity of the tar. There was nothing special in the treatment of the gas after it left the retort-house to account for the net calorific value being higher than might have been expected. He stated 10½ cwt. as the average charge, because they did not put an equal quantity of coal in every retort. The top retorts being slightly hotter and having two pipes, took a somewhat heavier charge. Then they reduced the amount until they got to the bottom retorts, which were on twelve-hour work; and there they put in a very heavy charge. In giving the figures of the quantity of coal carbonized per man, he did not pretend they were the best that could be obtained. The whole house of nine beds could be worked with very few more men; and this would automatically increase to a large extent the amount of coal handled per man. Practically it would be nearly double. Steam was used for generating electricity in place of gas-engines, because they had the boiler capacity available. The President asked whether it would be possible to take coke direct from the retort-house and load it into trucks. This would be the ideal plan; but the construction of the telpher track and the cross-over switch would not permit of it.

On the proposition of Mr. STEWART, seconded by Mr. GRIGGS, Mr. Pearce was heartily thanked for his paper.

MIDLAND JUNIORS AT LEICESTER.

Inspection of the Glover-West Plant.

Fortunate indeed were the members of the Midland Junior Gas Association to have an opportunity of inspecting the new installation of Glover-West vertical retorts at the Belgrave Gate Gas-Works of the Leicester Corporation during the very week of its official inauguration; and it was not surprising that a good number decided to avail themselves of the invitation. The party—which included Mr. W. J. Rendell Baker, of Mansfield (the President of the Midland Senior Association) and Mr. W. H. Johns, of Malvern (the President of the Midland Junior Association)—were met on arrival at the works by Mr. Hubert Pooley (the Engineer and Manager to the Corporation), who offered them a hearty welcome. Without loss of time, the inspection was commenced; the duties of guide being performed to the complete satisfaction of even the most inquisitive by Mr. Pooley and his assistants—Messrs. Lewis Smith, Valon, Rudge, Williams, and Hampden.

It is quite unnecessary to go into any details regarding the installation, as a full illustrated description was given in the "JOURNAL" last week. The excellent and lasting character of the work in connection with the retort-house and the completeness and good design of the coke-handling plant were generally commented upon; while the manifest cleanliness of the whole process was also noted. First the visitors were taken up by the electric lift to the top of the house, where they saw the buckets on the conveyor automatically emptying their contents into the hoppers above the retorts. Returning to the ground level, much interest was taken in the mechanical coke-extracting apparatus. The explanations given by the guides, and a coloured diagram of the Glover-West system which was included in a neat little *brochure* distributed among the visitors, enabled everything to be clearly understood; and a profitable time passed all too quickly for the seekers after knowledge.

Leaving the works, the party were taken to Winn's Café, where they were the guests of the Gas Committee at high tea—Alderman Thomas Smith, J.P., the Chairman of the Committee, presiding. Subsequently,

The PRESIDENT said he thought they would all agree that they could not possibly leave Leicester without voicing their feelings of satisfaction at the visit, which had been much looked forward to. The Leicester gas undertaking had made a very great name in the industry, due to the fine administration of those who had been in power in the past, and also to the fact that the Engineers had been such prominent and capable men. He referred to the late Mr. Alfred Colson, and to Mr. Pooley, who was well known to all of them, not only in England, but in Scotland also. It was a credit to Mr. Pooley that he had been able to obtain an appointment in a Scotch gas-works. Their visit to Leicester had been most pleasant and instructive. Personally, he had picked up a great deal of information. There was plant to be seen which an engineer could learn a lot from. The smooth working of the installation was a credit to all who had been connected with the design, construction, and operation of it. He proposed a very hearty vote of thanks to Alderman Smith for honouring them with his presence, to the Gas Committee for their kindness in entertaining the members and for giving them permission to inspect the works, and to Mr. Pooley and his assistants for the cordial way in which they had received them and so fully answered the numerous questions which had been asked.

The SENIOR VICE-PRESIDENT (Mr. F. J. Ward, of Knowle), in seconding the proposition, agreed that the visit had been much looked forward to, and that all anticipations had been fully realized. They were aware already, he said, that Leicester was a most progressive town; and now they had further proof of the fact. They had found something to admire and to think about, and if possible to imitate in their own works.

Mr. RENDELL BAKER remarked that, as the President of the Senior Midland Association, it was a great pleasure to him to associate himself with the vote of thanks. He also had learned a good deal, and he greatly appreciated the cordiality of their reception.

The vote having been carried with applause,

Alderman SMITH, in response, said he fully appreciated the thanks they had been good enough to tender to him for being present, and to the Gas Committee for what they had done to make the visit a success. He had to apologize for the absence of his Vice-Chairman—one of the best of vice-chairmen one could have—who would have been present, but for the fact that he had sustained a very great bereavement. Proceeding, he said he took it that the Association was formed mainly for educational purposes, and he trusted they had seen something that afternoon which would be of benefit to them. After a very great deal

of consideration of the question of carbonization, their Committee came to the conclusion that the Glover-West system of vertical retorts was, for their purpose at all events, the best. In these days, when the application of science to the manufacture of gas was becoming more important day by day, and having regard also to the competition they had to meet from electricity, it behoved all gas authorities to be in the forefront in relation to this matter; and he hoped that those of them who were considering this question would have derived some useful knowledge from the visit.

The Claims of Labour.

There were, as they knew, a great many advantages in this system; but there were, as he had stated at the opening of the works earlier in the week, also some disadvantages. One of the greatest of these was the displacement of labour. This was a problem which those who had adopted such systems would have to face, as they in Leicester had had to do. But he was glad to say there was not a person who had been deprived of his work there in consequence of the installation who had not been found work of some other kind under the Corporation. [Applause.] Some of the outsiders were apt to look at these things altogether from a commercial point of view; but other people realized that there were claims on the part of those who worked these different plants which ought not to be overlooked. This was the view the Leicester Gas Committee had taken; and he thought that it was a humane view to take. He was quite sure the installation was going to do a great deal of good for Leicester, and that before very long they would be having an extension of it. He was sorry that time had not permitted the members to visit the other gas-works, but hoped at some future date they would come to Leicester again, when they would have an opportunity of doing so. Apart from the new carbonizing plant they had just inspected, he thought probably the Aylestone works were the most up-to-date ones in the country. There, again, they had studied the convenience of their workpeople. They had bathing accommodation, a recreation room, &c.; and, in fact, it had been the endeavour of the Committee to render the relationship between the workpeople and themselves of the most amicable character. A great deal depended, of course, in these undertakings on the men at the head of them; and Leicester had been exceedingly fortunate in getting Mr. Pooley to follow a man of the importance in the gas industry of the late Mr. Alfred Colson. There was no doubt that Mr. Colson was one of the best engineers in the country; and he believed in his successor they had a man of equal quality, and one who studied the interests, not only of the Corporation, but of those under him. He was glad to have had the opportunity of meeting the members, and trusted that the Association would continue to be successful, and that they would apply themselves to what was coming along. It was the young men who would have to carry on the work of those who had gone before them.

The Leicester Gas Undertaking.

Mr. Pooley, in the course of his remarks, stated that the Leicester Corporation owned two works. The ones they had seen that afternoon could produce 3 million cubic feet per diem, and had hitherto been treated as a scoop-charged works. But the old scoop charging, which cost some 2¾d. per 1000 cubic feet, had now been replaced by verticals which would, it was anticipated, cost something under ¾d. There was no other special feature in connection with these works, except that they were the first works which the Corporation would reconstruct. The whole place would be turned inside out, and they would make a new works there capable of producing just twice as much gas. The Aylestone works had four sections. The buildings in the first section were designed by local Architects; the Engineers being the brothers Robinson, who were famous in their day. They still had Mr. Charles Robinson living in Leicester. The second, third, and fourth sections were all designed by Mr. Colson; and they stood as a testimony to his skill. The first section was capable of producing 4 million cubic feet a day; but they were not able to purify this quantity. They would, however, deal with this as they put in their vertical retorts; and they would be able to produce in that section some 10 million cubic feet. The output of No. 2 section was 5 million cubic feet; and this they did, and were easily able to purify. When these works were reconstructed—which would not be for a very long time to come—they would be able to produce some 12½ million cubic feet of gas a day. Coming to the carburetted water-gas section, the plant was in three units of a million cubic feet capacity each. They were reconstructing there at the moment, and anticipated making considerable savings in oil. The chemical works were probably the model tar distillery and sulphate works of the country. They were making from Derbyshire coal in the sulphate of ammonia works from 26·5 to 30 lbs. of sulphate per ton of coal. The salt was a neutral salt, and the long crystals were characteristic. He thought it was mainly due to the fact that the salt was neutral that they obtained such beautiful crystals. In the tar-works they only dealt with the crude tar products—crude naphtha, crude creosote, carbolic acid, Colson's patent "Solvene," anthracene, and pitch. The processes had always been exceedingly profitable to the Corporation. In thanking them for the vote they had passed, he wanted to say how much he felt year by year the privileges that the members of the Junior Associations had, and the fine way in which they took advantage of these privileges. He wanted to congratulate them; but at the same time he wished to say that it behoved all of them to be most desperately in earnest. It was only the man who was in desperate earnest who was going to rise above his fellows and reach the highest degree of success. He would urge upon them to lose no opportunity whatever of gaining information such as they had been seeking that afternoon, and such as they sought so often during the winter months. He would beg, for the sake of the profession, that they should be even more energetic and more enthusiastic than to-day. They belonged to a glorious profession; but the requirements were great. They must be civil engineers, chemists, and administrators; and they must be good in each department. There must be no half-heartedness; but with such enthusiasm as he urged, nothing could stand against them. They could give the best form of light, heat, and power at the lowest cost; and so long as they were able to do this, they need fear nothing.

High-Pressure Lighting.

After tea, the majority of the members visited the compressor station, which is at present underneath the show-room and offices in the centre of the town, just about between the two gas-works. Some adjoining property has, however, been purchased; and it is intended to build a new and more commodious compressing station there.

There are now three sets of rotary compressors, each gas-engine driven, with a total capacity of 18,000 cubic feet per hour, which serve between 500 and 600 high-pressure lamps, mostly of 1000-candle power, chiefly employed for shop lighting. Passing through the streets to the station, there was ample opportunity for judging to what effective use they are put. The lamps are paid for at a certain rate for so many hours, and are supplied and maintained by the Corporation on an agreement. As to the public lighting, there are at present one street and a few points on the high-pressure system.

Three or four miles of high-pressure gas-main have been laid; and it is of cast iron, chiefly 6-inch. Another main is, however, being started on, which will encircle the town, and be 8¼ miles long, and of 12-inch cast iron. There will be a compressor station at each of the works; and the main will permit of boosting from works to works, and also at weak points in the area of supply. It is hoped that further developments in street lighting will follow the laying of this trunk main. The pressure for lighting is 7 inches mercury, or 3½ lbs. per square inch. An interesting feature of the lighting is to be found in the market place, where a 2-inch service is laid with provision for four rows of temporary piping, which is erected for each market day. A governor on each row of piping governs the pressure down to 10 inches of water, and flexible tube connections are provided for the inverted lamps used. The clock in the market square is also lighted by two 1000-candle power gas-lamps.

Keith lamps and compressors are used throughout. In one corner of the station, there is the original small compressor with which the department commenced high-pressure gas lighting. It has a capacity of about 1000 cubic feet per hour. This is now used only for the lamps in the offices, workshops, and show-room. In connection with the compressors, an interesting little matter may be mentioned. The water employed in the jacket for cooling is utilized for washing purposes in the offices; there being a connection with a circulating tank above.

On another point, it is gratifying to learn that the gas-fire business is developing very nicely at Leicester on the hire-purchase system. Though the system has only been in operation a short time, there are already about 3250 fires out under it.

ELECTRICITY: NOTES AND EXPERIENCES.

By S. Barker Johnson, of Hull.

[Extracts from a Paper read before the Yorkshire Junior Gas Association, Saturday, March 28.]

It is neither good manners nor good sense to speak in a depreciatory way of a rival; and we may cheerfully admit that for the electric light there is space, and ample space, without evicting the elder brother from his freehold. Each method of illumination or source of power has its particular uses and purposes, and neither branch stands to gain by a condemnation of the other. The subject of this paper will not consist therefore of arguments against and the "pulling to pieces" of electricity, but a brief enumeration of some of the fundamental principles and laws of electricity, to describe the working of electrical plant such as is used on a gas-works, and to give a few experiences of breakdowns.

To all intents and purposes we can divide electricity into two branches—electro-statics and current electricity or electro-dynamics. It is the latter branch that I intend treating of. Before dealing with dynamos, motors, starters, &c., I will enumerate a few common factors that are used continually in practice.

The author next dealt with the unit measurements used in electricity, and then briefly alluded to the various effects which are produced. Proceeding onwards in order, he took up the subjects of the generation of electricity and the construction of motors. Subsequently he dealt with the question of field magnets and motor starters and controllers.

Alternating Current Electricity.

Treating of this subject, he pointed out that a paper dealing with electricity would scarcely be complete without touching on alternate current working and a few of the fundamentals underlying working with such currents, as contrasted with continuous current—that is (as long as the external circuit is closed), current flowing continuously in one direction. There are, however, he pointed out, currents which do not flow in this way, but periodically reverse—flowing for a certain time in one direction and then reversing and flowing for another period of time in the opposite direction. These are called alternating currents. He proceeded to deal with "period" and "frequency." He pointed out that one complete oscillation or alternation is called the period of the current; while the number of periods accomplished per second is termed the frequency. He explained the terms by means of

diagrams, and mentioned the three main advantages of alternate current electricity—viz.,

(1) Transformation can take place from high to low pressure without the aid of moving machinery.
(2) The abolition of the commutator (and this is the cause of 90 per cent. of breakdowns in direct-current machines). [The commutator is a "nightmare" to the electrician, as "leakage" is to the gas manager.]
(3) To transmit the same power by alternate as by direct current, only 75 per cent. of the copper is required when using three-phase currents; and this is a saving, with copper at its present price.

There are several disadvantages, he mentioned, of which the following may be regarded as the most important:

(1) Alternate current electricity cannot be stored.
(2) The motors are less efficient, and in the case of the single-phase motor they will not start against load—*i.e.*, they must be started up on a fast-and-loose pulley system.
(3) Traction motors are heavy and cumbersome, and the speed regulation cannot be carried out without the aid of a large amount of auxiliary gear.

The next sections of the paper are given, practically speaking, *in extenso*.

Fuses and Fuse Wires.

Fuses are so commonplace and appear so simple, that it seems at first sight there cannot be much to say on the subject. Yet this is not the case, as several interesting laws and relations can be obtained from them.

You are all no doubt aware that, in practice, it is customary to protect circuits and apparatus from injury, and premises from the possibility of fire should an excessive current flow, by introducing "fuse wires," which melt and break the circuit when it exceeds a predetermined value. So that in order for a fuse to keep cool it must radiate heat at the same rate as it is generated.

A great difference of opinion exists as to the best fuse material under given conditions. For large currents and high pressures, copper is perhaps one of the best materials to use, because (1) for a given fusion current, the diameter is less than one of either tin or lead, and so we have not to contend with so much molten metal; (2) being harder, it is more reliable, since tendency to stretch is minimized, and when screwed-down, its sectional area is not reduced; and (3) it does not give off (like lead) an excessive amount of energy when fusing. The main drawback to the use of copper is (1) it sometimes remains quite hot for a considerable time before "blowing," and (2) for low power it is difficult to obtain it small enough. For ordinary currents and low pressures, tin is satisfactory as a fuse.

In all cases the fuse should be attached to a support of fire-proof material—usually glazed porcelain. In the case of "closed" fuses (such as wall fuses, &c.) the porcelain cover is generally supplied with ventilating holes, thus eliminating the possibility of an explosion consequent upon the rapid expansion of air inside when the fuse "blows," and also to minimize accidents should a lead fuse be inserted, as lead on fusing gives off such a large amount of gas and energy that it must never be employed in closed fuses. For switchboards and the like, open-fuse carriers are invariably used, and lead fuses employed. These carriers should not be placed under one another, as is very often the case—since when a "blow" results, the molten lead drops down on the top of the carrier beneath it and also on to any switch-gear that may be in its path, and so appears not only unsightly but has a tendency to clog-up the switch joints and prevent them working freely.

Another type of fuse—known as the "Sparklet"—also merits attention, and is used on high-pressure circuits. In it, two ordinary sparklets (such as one uses in making aërated waters) are employed. These are so arranged that if the fuse melts and an arc is formed, the latter burns away part of the metal case of the sparklet, thus allowing a rapid escape of the contained carbonic acid gas which extinguishes the arc.

Breakdowns.

Coming now to the breakdowns of electrical machinery, I will divide all the various parts of a machine that I have known to fail and cause trouble, into four divisions.

(1) Stationary parts carrying current.
(2) Stationary parts not carrying current.
(3) Moving parts carrying current.
(4) Moving parts not carrying current.

To No. 1 class belong the field coils, brush gear, and terminals. To No. 2 belong the frame of the machine, the bearings, and the pole pieces. No. 3 class includes the armature and commutator. No. 4 division includes binding wires, shafts, lubricating rings, and pinions or couplings.

Field Coils.

Many failures have been occasioned by the expansion and contraction that take place, and by the collection of oil and conducting dust whereby the insulation is gradually weakened, and this together with deterioration due to heating (and in some motors this factor is not small) causes in time either a "short-circuit" or else an "earth." By the former I mean that the insulation in the interior of the field coil has weakened to such an extent that several wires have been bared, and although they may not be in contact with the frame or "earth," yet the current is not travelling in all the windings, but only in a few of them, and "short-circuiting" takes place—resulting in time in a "burning-out." Other breakdowns have arisen through the leading-in wire breaking off, and by water finding its way in and so rusting-up and eating-away the coils. A good plan is to drill a hole in the base of the motor framework, so that any water that should happen to get into the interior will not accumulate and do harm.

Brush Gear.

The majority of motors are fitted with carbon brushes and holders of the spring type. Should the brush wear away, trouble is sometimes caused owing to the spring ceasing to press firmly on it; and if the brush does not work or move freely and so fails to make proper working contact with the commutator, the latter soon gets into a bad state, due to the sparking and flashing. The breakdown of the insulation between the brush spindle and the rocker bar is not uncommon. In trying to save space, the brush leads in some motors are often to be found in close contact with the armature or commutator, or else at the bottom of the motor, enveloped with dust and saturated with oil. They should always be carefully fixed, and not left to find a position for themselves.

Terminals.

Insulation, which is generally recognized as constituting the most vulnerable part of electrical machinery, is often found to be very scant in the terminal boxes; and as is often the case, the latter are fixed in very awkward positions. The result is that they are not looked at and cleaned until they really do go wrong. The effect of heating on insulation is generally to produce brittleness and eventually carbonization, which causes a failure—more especially in the case of running machinery where the windings are subjected to vibration and to other mechanical stresses set up under operating conditions. The "earthing" of the shunt-wire terminal will lead to disastrous results, as the motor will commence to attain a terrific speed, in consequence of the weakened field, and so wreck the armature.

Bearings.

These, as with all other moving machinery, require to be kept cool, and the brasses are not allowed to wear-down to such an extent as to admit of the armature touching or scraping the pole faces. The clearance between these two is very little more than $\frac{1}{16}$ inch; so a great deal of damage can soon be done. In every machine, provision should be made not only for indicating the amount of oil in the baths but also for emptying and cleaning them out periodically, as dust and dirt find their way in everywhere—and a gas-works is no exception.

Armatures.

Failures in the armature windings are mostly due to "burning out" due to heating, through lack of ventilation, together with deterioration of the insulating material. Sometimes too much end-play on the shaft causes failure. The armatures of hoisting motors—as used on telphers, cranes, &c.—are sometimes liable to damage owing to the excessive speed that generally accompanies the raising or lowering of the load.

After giving what the author called an easy workshop method of finding a fault in an armature, the paper took up the subject of

Commutators.

As I have already said when treating on alternate currents, the commutator is the cause of 90 per cent. of the breakdowns, due to sparking, unsatisfactory insulation between the commutator bars, and even bad workmanship at the soldered connections. The commutator must be looked at at least once a week, when it should be cleaned and polished-up by means of bedding a piece of sand paper on to a piece of wood made to the same curvature as the motor commutator. Unless the commutator is kept in fairly good order, it is a physical impossibility for the motor to work with any degree of satisfaction. The mica strips must be of uniform thickness; otherwise dirt may work down between adjacent copper segments, assisted by any oil that may creep from the bearings on to the commutator, and ultimately cause pitting along the edges of the strips. If there is an excess of shellac in the strips, this may soften at the running temperature of the machine, and allow the segments to slacken—causing "flats" in some places and "high-bars" in others. Further, if oil gets on the commutator, it will find its way into, and ultimately completely permeate, the strips. Evidence seems to indicate that this oil, due to centrifugal force, and to some extent to capillary attraction, is kept in motion and is continually being carbonized by sparking under the brushes, until short-circuits and consequent pitting of the commutator occur between the copper segments.

Passing over the sections of the communication dealing with binding wires, motor shafts, lubricating rings, and pinions of couplings, the last portion of the paper dealt with

Starters and Controllers.

Starters and controllers are very inconsistent. Sometimes they will run for months, and at other times they are a constant worry. In the starter world, the trouble invariably results in a "burn-out." Particles of tar finding their way into the casing and lodging on the contact-pieces and so preventing the lever from swinging right back is another cause of failure. The no-volt coil is sometimes too weak for its work, and gradually becomes overheated and burns out. Insulation between the starter and the operating handle occasionally breaks down.

Controllers differ from starters in that they require rather more

keeping in order, owing to their having more moving parts. As a rule, controllers are provided with magnetic blow-outs, which "blow out" the spark should any exist.

Conclusion.

In conclusion, I wish to plead for the fusion of the studies of gas and electrical engineering. It behoves everyone to obtain at least an elementary knowledge of this latter subject. The industry has within its junior ranks a number of very excellent and promising young men. The best way to improve the circumstances and emoluments of any profession is to begin by improving the men who engage in it. It is a true saying that the success of any business institution is the sum of the successes of the individuals in the institution. Formerly higher technical education was limited and costly; but under conditions prevailing at the present time technical education is cheap and within the means of everyone. Thus those who do not avail themselves of the opportunities presented have only themselves to blame. Life is one long lesson, and it is not everyone who knows enough not to know too much. Let us diffuse among ourselves such intellectual light as we may possess—sharing freely with other members of our Association whatever new light we may gain to aid us in the industry which we serve, and which in turn serves us.

DISCUSSION.

Mr. H. Townsend, Jun. (Wakefield), said that he had some experience of trouble with the commutator of a dynamo at the works at which he is engaged. It was in the days when they were rather unused to electrical machinery. The commutator was badly worn through neglect, and was sparking. It was taken to the mechanics' shop to deal with, and some mica became dislodged, with the result that when the dynamo was put into use again there were four burnt-out coils, and the armature had to be sent back to the makers. He thought that troubles were bound to be common where ordinary mechanics tried to do repairs to electrical machines. He wondered whether Mr. Johnson had had experience of the kind of trouble he had mentioned.

Mr. Johnson said he had had experience of the sparking, flashing commutator; but he had rigged up a miniature lathe, and turned the commutator true, and as no mica was dislodged the job was satisfactory.

Mr. J. H. Hill (York) said they had not any electric motors at his place, and he was rather glad of it, judging by what he heard of the experience of them elsewhere. He wondered, indeed, how the manufacturers made them pay; for they let them out on hire for 10 per cent. of the cost, and undertook to keep them working. There seemed to be never a week they were not being repaired or exchanged. There was a laundry from which he had a report of a fire and explosion attributed to gas, but which proved to be due to electricity used in connection with a calendering machine. It was contended that electricity was not the cause, because the machine was distant from where the supposed gas explosion took place. But there was a steam-pipe which went from the calendering machine to a point very near the gas-pipe. The steam-pipe was carefully insulated all along the wall; and it was simply a case of an induced current in the secondary coil—in the circuit of the hot-water pipe—fusing the lead gas-pipe. They found that it had burned a big hole in a 1½-inch lead pipe which was 3 or 4 inches long. Shortly after this the same kind of thing happened at a chemical works. In regard to fuses blowing, he had had an experience at a piano factory; and it was nothing short of a miracle that the place was not burnt down. In this case a man who was in the room at the time saw the fuse blow, and instantly there was a flash of fire at the gas-pipe. The cutting of the circuit by the fuse blowing had sparked across direct from the electric circuit to the gas circuit. It was important that they should be aware what kind of tricks electricity might play them.

Mr. E. Garsed (Kippax) asked whether Mr. Johnson had any comparison of the costs of running various gas-works plants by electric motors, as against steam, and particularly whether hehad any knowledge about driving exhausters by electric motors.

Mr. Johnson replied that he had no such comparison of costs as were asked for; but he knew there were exhausters which were driven by electric motors.

Mr. J. H. Lee (Chesterfield) said there was an electric motor at the works with which he was concerned; and they would be glad to sell it cheap to anybody who wanted to buy. They generated their own electricity, and charged nothing for gas, but had found the electric exhauster so costly and troublesome that they had shut it down, and put the steam exhausters in use. The cost for the generation of electricity—without counting any charge for gas, and without any distribution cost except as to the very small area within the works—was 0·11d. per unit.

Mr. J. W. Fell (Manchester) moved a vote of thanks to Mr. Johnson. In many gas-works, he said, electricity was used for certain purposes, with a view to special precautions as to safety when giving light in different operations. One well-known form of use was the portable hand lamp, which people carried round with a great length of flexible wire trailing after them. He knew a case in which, when one of these lamps was used in examining the interior of a scrubber, a short-circuit took place, and there was a flash and an explosion. Fortunately, the men who should have been there and examining the scrubber were not about at the moment, and so no injury was done; but it was an incident from which they should derive a lesson. Where such appliances were used, it was well to make sure of thorough and frequent examinations of them.

Mr. Lee, in seconding the vote, said it seemed to him that they should all regard electricity from the point of view that it was something which had come to stay; and, this being so, they who were in the gas industry should aim at understanding their competitor in all the detail that they could possibly grasp. It was no use contenting themselves with merely pointing out some of the defects of their competitor. So far as this was concerned, the electrical engineer could just as well come along and point out deficiencies in gas. He thought it was the business of the gas and electricity people, not to tear each other to pieces, but to understand each other in all the ways they could. Mr. Johnson, by his paper, had helped very materially to this end.

Mr. Hill, in supporting the resolution, said Mr. Johnson, who had previously shown himself to be very much up to date in regard to gas-works, had now shown his wisdom also in going to the root of the matter of the working of the electrical machinery which he had to control; and this would be of very great advantage to anybody concerned with gas.

The resolution having been passed with acclamation,

Mr. Johnson, in reply, did not agree to a mere pulling to pieces of electricity and its machinery. It was far more scientific and useful to gain a knowledge of the competing power.

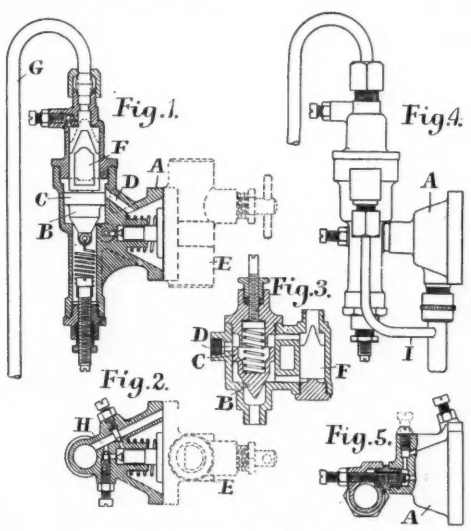
REGISTER OF PATENTS.

Lighting and Extinguishing Gas-Lamps.

Keith, J. & G., of Farringdon Avenue, E.C.

No. 2414; Jan. 29, 1913.

This invention relates to a valve-controlled system for use in lighting and extinguishing the burners of high-pressure gas-lamps of the type in which the supply valve is adapted to be closed by a temporary increase of pressure above the normal working pressure. It includes an extinguishing device comprising main and auxiliary or pilot valve elements, and an operating member movable therewith; the valve elements being bodily movable within casings formed with seats for engagement by the valve elements, and adapted respectively when the pressure is increased to permit a supply of gas to pass to the automatic lighting device to close the main burner-supply valve and to obstruct a connection leading to a pilot light.



Keith's Lamplighter and Extinguisher.

Fig. 1 is a vertical section and fig. 2 a horizontal section of automatic extinguishing means and the cap of an automatic lighting device. Fig. 3 is a vertical section of the extinguishing means (showing a modification). Fig. 4 is an elevation, and fig. 5 a part plan part horizontal section of automatic extinguishing means detachably secured to the cap of an automatic lighter (showing a further modification).

The automatic extinguishing means comprises a casing, integral with the cap A, within which is fitted a main valve element B adapted to rest on a seat in the casing, and loaded by weights or a spring—preferably a tension spring with adjusting means, including a rotable screw projecting beyond the lower end of the casing through a gland. The upper portion of B is provided with an enlargement constituting a piston C adapted to operate within a chamber in the valve casing, formed with a port D leading to the chamber from the cap of the automatic gas-lighting device E. The port is so disposed that, when the piston is in its normal position (as shown), it is exposed so as to communicate with a space afforded between the upper face of the piston and the inner face of an upward extension of the valve casing. Within this extension operates a pilot-light valve element F normally resting at its lower end on the upper face of the piston C, the upper end constituting the pilot light valve proper and being adapted to engage a seat adjacent to the upper end of an extension connected to the piping G leading to the lamp, and serving to supply gas for the pilot light. The auxiliary valve F is so formed that when it is in normal position

the pilot light supply is permitted (as shown) to pass freely from the cap of the gas lighting device E to the pilot supply piping G. Gas under the normal high pressure is introduced beneath the main valve B by a passage H connected to the high-pressure side of the diaphragm within the automatic lighting device.

The extinguishing device is so adjusted that, when the pressure of gas is raised slightly above the normal high pressure, the main valve B is disengaged from its seat, and the escaping gas, acting upon the increased area afforded by the lower face of the piston C, causes the main valve to be blown suddenly upwards within its casing. The initial movement of the valve first causes the piston C to close the port D, and the further upward movement of the valve permits communication between the port and the space on the lower side of the piston. Simultaneously the movement of the main valve and piston causes the upper end of the element F to engage its seat, thus obstructing the outlet to the piping G conveying the pilot-light supply to the lamp. The high-pressure gas acting beneath the main valve and piston passes by way of the port D to the low-pressure side of the diaphragm within the cap A, so as to counterbalance the high pressure which normally maintains the diaphragm in its open position out of contact with its seat, and permits a spring mounted on the plunger shown to force the diaphragm on to its seat—thus obstructing the passage of gas through the lighting device E to the burners. Thereupon the gas leaks past the piston to its upper face, and eventually its pressure counterbalances the pressure acting on the lower face of the piston and on the face of the main valve, thereby permitting the valve to be closed by the action of the spring. The pressure of gas then acting on the upper face of the piston maintains the upper end of the element F in engagement with its seat until the valve B has been closed; the pilot-light valve being thereafter held to its seat by the normal high pressure of gas passing from the cap A to the casing of the automatic extinguishing device, by way of the port D.

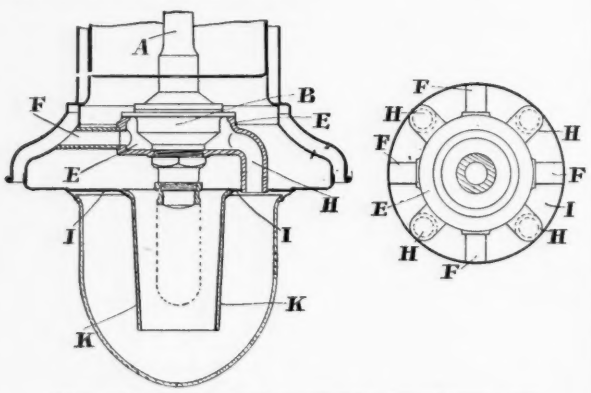
The construction shown in figs. 4 and 5 is substantially the same, save that the casing of the extinguisher is detachably connected to the cap A of an existing automatic lighting device, a pipe connection I being attached at a point outside the cap and leading to a branch opening into the chamber within which the piston C and the main valve operate—the pipe connection I being substituted for the port D. In this case, the low-pressure regulatable screw is removed, and its corresponding orifice plugged by a screw serving to permit a free supply of gas to pass to the casing.

Incandescent Gas-Lamps.

MILNE, J. R., and GOAD, F. L., of Edinburgh.

No. 5845; March 10, 1913.

This invention relates to high or low pressure inverted incandescent gas-lamps wherein the secondary air is passed through a heating chamber placed in such a position that it is heated directly by the products of combustion, and from which the secondary air is led to the lower surface of the inverted mantle.



Milne and Goad's Inverted Regenerative Incandescent Lamp.

The gas and primary air pass downwards through the tube A, and thence through a mixing chamber B and nozzle to the mantle. Surrounding the mixing device and nozzle is an air-heating chamber E, which communicates by (say) four radial tubes F with the outer casing of the lamp, so that air may pass through the tubes to the chamber E. Leading from the chamber E are a number of tubes H arranged between the tubes F and extending downwards through a ring plate I supported in the lamp. The mantle is completely enclosed by an outer globe. Provided between the globe and mantle is an open-ended and slightly tapered chimney K, and the tubes H open into the annular space between the outer globe and the chimney, so that the secondary air passes through the air-heating chamber E, and thence to the annular space between the globe and the chimney. By this arrangement the space is filled with air at a temperature which is slightly lower than the temperature of the air between the chimney and the mantle; the difference between the two temperatures being sufficient to cause an upward draught from the chimney. Thus a current of secondary air is drawn through the chamber E and down the outside of the chimney K to the foot of the mantle, while the hot products of combustion pass round the outside of the chamber E and tubes F H.

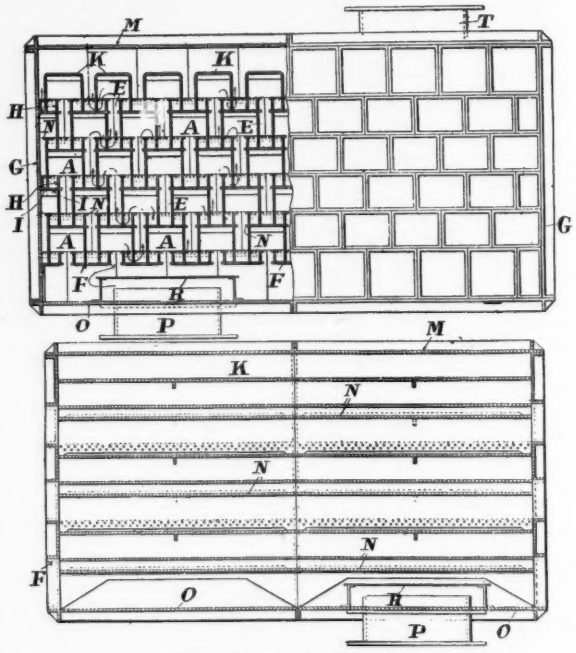
Washing or Scrubbing Gas.

WILLIAMS, P. E., of Wanstead, Essex.

No. 10,066; April 29, 1913.

This invention has reference to gas washing or scrubbing apparatus of the kind in which the gas is caused to flow upwards through the stationary apparatus, and come in contact with the washing liquid falling through it.

In the construction shown (in sectional elevation and cross-section) the scrubber consists of long gas-distributing chambers A of rectangular section, with trough-like recesses in their upper sides, which are provided at each end (which is closed) with external upper, lower, and vertical flanges so that they can be fixed together to form a number of superposed gas-distributing chambers having vertical gas passages E between their adjacent side walls, and which, except in the case of the lower set of chambers, which rest in troughs F, are arranged to enter the recesses in the upper sides of the chambers below and rest upon the bottoms of them. The lower portions of the side walls of the chambers forming the side walls of the gas passages E are formed with a number of perforations, and are notched at the bottom to form openings; and the recesses in the upper sides of the chamber and the troughs F are filled with washing liquid (water). Between the sides of the chambers in the second and each alternate horizontal set of chambers that are next to adjacent side walls G are vertical plates H, each formed with a horizontal plate-like extension I with an upwardly extending flange at its opposite side, and with flanges at each of its two ends like the gas-distributing chambers A, so that the plates can be fixed to the chambers and to the side walls to form vertical gas passages therewith, and also troughs into which the outer sides of the gas-distributing chambers above them extend.



Williams's Washer-Scrubber.

Over the top of the gas passages E between the uppermost chambers and the plates H, and resting in the recessed portions of them, are inverted trough-shaped covers K, having perforated sides, and provided at opposite ends with flanges like the chambers A, so that the covers can be fixed both to the chambers A and to a cover plate M fixed to the side walls G. The plate M is provided with openings to receive inlet pipes arranged to direct the washing liquid into the recesses in the uppermost chambers A and plates H. Consequently the gas passages are closed at the bottom and ends, so that the gas, in passing through the apparatus, has to flow through the holes in the side walls of the chambers A in the form of a number of streams, whereby it is brought into effective contact with the washing liquid, while the latter liquid, together with the tar and other impurities removed from the gas, passes under the side walls, through the openings shown. "In this way, tarry particles, ammonia, and other impurities such as sulphuretted hydrogen and carbon dioxide are removed from the gas in a very effective manner."

The upper ends of the side walls of the chambers A and of the plates H may be provided with lateral flanges N, that overhang the passages E in order that the streams of washing liquid overflowing from the recesses in the upper ends of the chambers and the troughs carried by the plates H into the vertical passages shall fall clear of the sides of the chambers and plates, so that the ascending streams of gas will again be brought into effective contact with them. The lower troughs F have upper, lower, and side flanges for connecting them together, to the next upper set of chambers A, to the side walls G, and to a bottom plate O, to which is fixed an upwardly extending gas inlet pipe P. A protecting baffle R is secured above the pipe to prevent liquid entering it. To one side of the casing, and fixed to the bottom plate, is an overflow pipe that depends into and is sealed by liquid in a sump not shown. T is the gas outlet.

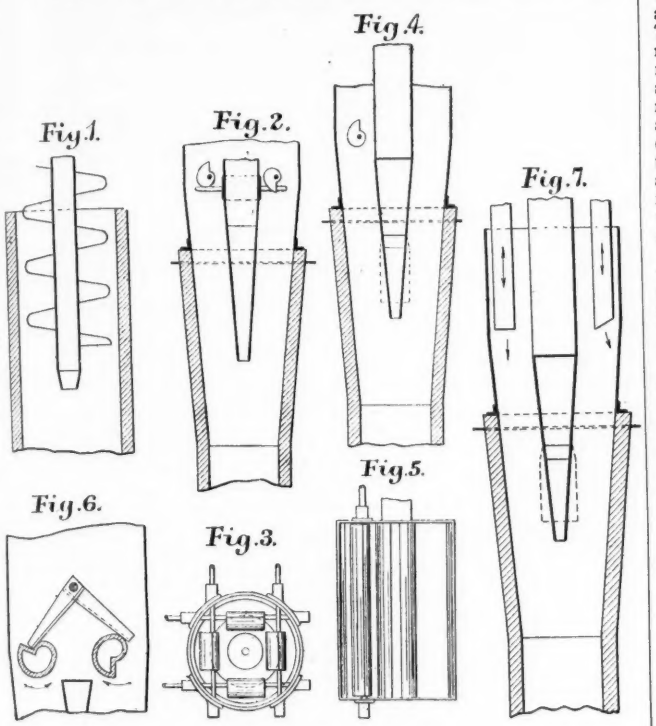
Feeding and Distributing Charges in Vertical Retorts.

AARTS, J. G. of Dongen, Holland.

No. 17,611; July 31, 1913. Convention date, Aug. 1, 1912.

This invention relates, more particularly, to retorts of uniform section throughout their whole height, and in which the height of the charge remains constant. The object of the invention (in the words of the patentee) is to produce in the charge differences of density or

compactness in such a manner that the density or compactness is least at the centre or middle of the retort, and increases gradually towards the sides or walls, where it is greatest. Another object of the invention is to produce automatically, and independently of the rate of discharge at the lower portion of the retort, a compression of constant magnitude within the upper portion of the charge fed into the retort.



Aarts's Vertical Retort Feeder.

The discharge of the distillates takes place in the form of ascending currents of decreasing temperature which converge towards the centre or middle of the retort, and are thus secured against dissociation by contact with the walls of the retort which are subjected to external heat. The charge, it is said, has a great stability, and is maintained in contact with the sides of the retort even in the zone of constriction. The charge, moreover, descends, without giving rise to obstructions, along the heated side of the retort—thus ensuring perfect transmission of heat, which is not impaired by the passage of gases between the charge and the sides of the retort. The distillates may be collected at the centre or middle of the charge over the zone of the least density. It is not necessary to use a separate closing device at the upper portion of the retort, as the reserve charge contained within the reservoir or the upper extension of the retort is compressed to such an extent as to ensure a sufficiently tight closure which prevents the escape of gas. Furthermore, this manner of distributing the charge, it is claimed, allows of the employment of uniformly pulverized coal, and of obtaining a coke-like or carbonized compact product of high and uniform density, which is formed with cracks along its whole height in the zone of minimum density of the distilled charge, which cracks enable it to be easily removed.

Several constructions of apparatus adapted for carrying out the method patented are shown in the specification. In fig. 1 there is arranged within the retort (of cylindrical shape) a spiral screw, which continuously compresses the charge, and is furnished with a hollow tube which serves as the discharge passage for the distillates. The charge, being sufficiently compressed, closes the annular space round the tube, the lower end of which practically corresponds with the whole middle zone of minimum density through which the discharge or escape of the distillates takes place in an ascending current.

In the form shown in figs. 2 and 3 (vertical section and plan), the circular retort is provided with a widened extension carrying a reservoir containing the reserve charge. The discharge tube, arranged in the centre of the retort, has a conical portion, the sides of which are approximately parallel to the sides of the widened portion connecting the retort with the reservoir above. Within the reservoir are arranged cam-shaped rollers, for compressing the charge, mounted upon shafts supported in bearings preferably arranged outside the reservoir, and operated in any suitable manner.

The coal passes from the reservoir above into the retort through an annular passage lying between the centre discharge tube and the extension. The particles of the coal which reach the centre of the retort are therefore compelled to follow an inclined path which is somewhat bent; whereas the particles which reach the periphery of the retort follow an inclined, but straight, path. The inner particles of a certain horizontal layer within the reservoir have, therefore, to perform a movement of greater length than the outer particles of the same layer, if it is assumed that the particles of a horizontal layer in the reservoir arrive into the same horizontal plane of the retort. The result is that, when the particles pass from the annular passage into the retort, the density of the coal will be less near the centre than at the periphery. Moreover, this difference of density is augmented by the influence of the weight of the reserve charge, which presses mainly upon the outer portion; while the centre of the coal, being situated in the space below the discharge pipe, is more or less entirely relieved of the pressure of the charge. By the rotation of the rollers the charge is compressed and is uniformly fed downwardly.

Figs. 4 and 5 show, in vertical section and plan, an arrangement in which the retort is of rectangular shape and provided with a widened extension which carries a reservoir containing the reserve charge. The discharge passage is formed by two outwardly and upwardly inclined walls which extend through the whole width of the retort and reservoir, and are substantially parallel to the inclined walls of the extension. The discharge passage is extended through one of the sides of the retort. The longitudinal walls of the discharge passage are approximately parallel to the longitudinal sides of the extension of the retort and of the lower portion of the reservoir. The coal descends into the retort through two spaces between the walls of the discharge passage and the outer walls, and is distributed in such a manner that the density at the centre is smaller than at the walls. In this construction there may also be provided compressing rollers within the reservoir, as shown in the left-hand portion. The right-hand portions (not showing any compressing roller) are intended to illustrate a construction in which the compression of the charge is obtained by the height of the column of the reserve charge.

Fig. 6 shows, in vertical section, a reservoir for the reserve charge which may be applied to a retort of rectangular section similar to that shown in figs. 4 and 5. In this construction, the discharge passage does not support the weight of the reserve charge, and the feeding device is so arranged as to cause the coal to descend and be compressed mainly along the long sides of the retort.

Fig. 7 shows a construction in which the charge is compressed by stamps which receive an up-and-down movement by (say) an eccentric. The stamps may extend along the long sides of the retort if the latter is of the rectangular section shown in figs. 4 and 5, or they may be uniformly distributed in a circle in the case of a circular or cylindrical retort. In the latter case, instead of using several stamps, one stamp of annular section might be employed. The stamp shown in the left portion of fig. 7 compresses the material mainly in the vertical direction; whereas the right-hand stamp is provided with an inclined operating surface, and compresses the charge downwardly and outwardly. A stamp of this latter form, therefore, serves to increase the density of the charge towards the walls.

Means are also illustrated in the specification for automatically throwing out of action the compressor and feeder of the charge whenever the resistance offered by the compressed charge reaches a certain maximum, while causing the means to resume their automatic action immediately the resistance decreases below the allowed maximum. These means consist essentially in an automatic coupling which is interposed between the driving motor and the means for compressing or feeding the charge.

Two-Cycle Gas-Engines.

DANIEL, P., of New York.

No. 13,457; June 10, 1913. Convention date, June 11, 1912.

This two-stroke cycle gas-engine is of the type in which the inrush of live gases expels the dead gases from the cylinder, and the exhaust opens before the inlet opens, and closes before the inlet closes. The object of the invention is to increase the certainty of a rapid inrush of gas and air, and also to promote the cooling of the cylinders.

With these ends in view, the principal feature of the invention consists in so controlling the inlet and exhaust ports that a remnant of the exhaust gases remains in the cylinder after the exhaust is closed; the condensation of the remnant by the incoming live gases causing a partial vacuum which accelerates the entrance of the live gases.

A subsidiary feature of the invention consists in making the time between the opening of the exhaust and the inlet substantially equal to the time between the closing of the inlet and the exhaust—no invention, however, being claimed for this feature *per se*, but only in respect of the combination with the feature set forth above.

When the invention is applied to multi-cylinder engines, the cylinders are preferably disposed in a row of couples—the cylinders of each couple making an acute angle with each other; and the gases are supplied to the cylinders from a reservoir located within the angle and extending along the row of couples.

APPLICATIONS FOR LETTERS PATENT.

6606.—LAMB, J., "Burners." March 16.

6669.—BEHRENS, J., "Preparing aliphatic aldehydes from the gases proceeding from the dry distillation of coal, &c." March 16.

6670.—ARNOLD, L. R., "Hot-air circulator for gas-fires, &c." March 17.

6742.—REHFELD, L., "Gas-burners." March 17.

6747.—KELLER, R., "Acetylene generator." March 17.

6757.—JUNKERS, H., "Water-heater." March 17.

6767.—SIEMENS BROS. AND CO., LTD., "Quantitative analysis of gaseous mixtures." A communication from the Siemens and Halske Akt.-Ges. March 17.

6830.—GIBSON, A. H., "Regulating the flow of water." March 18.

6850.—BRODIE, C. G., "Water-meters." March 18.

6903.—SOC. L'ASTER., "Meters for liquids." March 18.

6909.—BATEMAN, H. L., "Production of gas." March 18.

7006.—HEMMING, H. J. R., "Gas-pumps." March 19.

7059.—HARVEY, E., "Gas-stoves." March 20.

7082.—KAUFMAN, A., "Portable gas-stoves." March 20.

7086.—CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LTD., and DARWIN, H., "Measuring the rate of flow of liquids." March 20.

7101.—DRESSER, D. L., "Generation of combustion products." March 20.

7116.—TOZER, C. W., "Retort." March 20.

7117.—TOZER, C. W., "Treating carbonaceous material." March 20.

7118.—JUNKERS, H., "Water-heater." March 20.

7178.—SIMPSON, W. M., "Burners." March 21.

7188.—DAVEY, W. G., "Burners." March 21.

7198.—FOURNESS MANUFACTURING COMPANY, LTD, and MARTIN, J., "Water-heaters." March 21.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Alliance and Dublin Consumers' Gas Company.

SIR,—In the "JOURNAL" dated March 24, you refer to a remark in my circular letter of March 16, and sent out on March 20, "that it is not in the best interests of the shareholders that it [the experts' report] should be distributed broadcast." You ask "Why."

As it is my intention to refer to the matter at the shareholders' meeting on March 31, I think it is only fitting that what I have to say should not be anticipated in the "JOURNAL," which I understand will be issued the same morning that the meeting will be held.

May I, however, correct a misstatement in your article, where you say: "The Directors now claim that no one has the right to circulate the report without the authority of the Board." You omit the second half of the sentence, which reads, "or a resolution passed by the shareholders in general meeting calling for it to be circulated." It is only fair to give the full context, which surely means that the matter is entirely in the hands of the shareholders.

F. J. DICKENS.

Worsley, March 28, 1914.

Self-Acting Syphons and Fittings Drips.

SIR,—On reading over Mr. Alex Paterson's paper in your issue of Dec. 23 (p. 942), I thought a description of a self-acting syphon which I have used, and which cannot dry-up and permit an escape of gas, might be of interest and possibly of service to the gas industry.

I was once much troubled with a syphon which would fill-up very unexpectedly; and after a considerable amount of trouble with it, I hit upon the following arrangement, which stopped once and for all a considerable expenditure of time and trouble—see fig. 1.

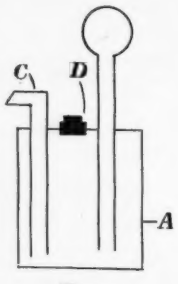


Fig. 1.

Fig. 2.

A is an ordinary drip; the connection from the main or service being carried down nearly to the bottom of it. The pumping pipe C has an elbow screwed on, which forms the overflow. D is a plug screwed into the top of the drip.

The drip is connected to the main or service in the ordinary way. One has only to take out the plug D, and fill the drip with lubricating oil, screw in the plug, and the drip is ready for use.

If water collects, it will drop to the bottom of the drip, owing to the difference in specific gravity, and as more collects will find its way up the overflow pipe. If water ceases to collect, the oil will form an effectual seal, with no possibility of an escape of gas.

If necessary, a pipe can be screwed into the drip at D, and brought up to the level of the road, so that the attendant can test the amount of oil in the drip—say, once in six months.

I think that for other than low-lying districts subject to floods, the drip should be found safe and effectual, and save managers and engineers a considerable amount of anxiety.

Of course, the overflow would need to be properly pitched so that the water could get away.

With a piece of wrought-iron pipe and a piece of ⅜-inch brass tube and elbow [fig. 2], a fittings drip can be made on the same principle.

L. BLACKMAN,
Manager, Borough Council Gas-Works.

Hamilton, New Zealand, Feb. 14, 1914.

Price of Gas at Rawmarsh.—It has been decided by the Rawmarsh Urban District Council to hold a special meeting at an early date to take into consideration the advisability of reducing the price of gas.

A Sixpenny Increase in Price at Conway.—The questions of the recent litigation and the alterations to the gas-works necessary to comply with the order of the Chancery Court were submitted to the Conway Town Council last Wednesday, in the shape of a report by the Gas Committee. It was pointed out that the costs of the action and the appeal are about £4000; and the cost of the alterations is estimated at £600. If the former sum can be borrowed for five years and the latter for fifteen years, this will entail an expenditure in interest and sinking fund for the first five years of £933 a year. On the net sale of gas of about 31,500,000 cubic feet, an increase of 6d. in the price per 1000 cubic feet will realize about £787; but next year a loan will fall out, the annual payment in connection with which is £360. None of the expenses in connection with the action could be paid for out of the rates. The Council unanimously resolved to increase the price of gas from 3s. 6d. to 4s. per 1000 cubic feet as from the 25th inst.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Bills:

The Hightown Gas and Electricity Bill and the Edenbridge Gas Bill were read a second time and committed

The Abertillery and District Water Bill was read the third time, passed, and sent to the Commons.

The following Bills were reported with amendments: Stone Gas and Electricity, Cleckheaton Urban District Council, Newport Corporation, South Bank and Normanby Gas, and Whitwell and District Gas.

The Ashington Urban District Council Bill was brought from the Commons and read the first time.

It was agreed that the Standing Orders not complied with in respect of the additional provision in the Hightown Gas and Electricity Bill should be dispensed with, and leave given to the Committee to insert the provision.

The Select Committee reported that they had not proceeded with the consideration of the Mexborough Urban District Council Bill and the Mexborough Water Bill, the opposition having been withdrawn. The Bills were committed.

A Committee on Smoke Abatement.

Lord Newton last Tuesday moved the second reading of the Smoke Abatement Bill in the House of Lords, and said that, as he recognized there was not the remotest chance of the Bill, moderate as it was, passing into law, he would ask the Government to institute an inquiry, by a Royal Commission or a Departmental Committee. Lord Curzon described what had been accomplished by legislation in India; and Lord Allendale then announced that the President of the Local Government Board proposed to appoint a strong Departmental Committee to examine the present state of the law and to make proposals for the consideration of Parliament. He expressed the hope that all the interests concerned would take part; and Lord Newton thereupon withdrew the motion for the second reading of the Bill, saying that, if invited, he would be willing to serve on the Committee. It is stated that Mr. Russell Rea, M.P., will act as Chairman of the Committee.

HOUSE OF COMMONS.

The South Suburban Gas Bill was read a second time and referred to the Examiners.

The Northwich Urban District Council Bill and the Provisional Order (No. 1) Bill were read a second time and committed.

The Southend Gas Bill and the Barnsley Corporation Bill were reported with amendments.

The Ashington Urban District Council Bill and the Bedwas and Machen Urban District Council Bill were read the third time and passed.

The Market Rasen Water Bill, referred to the Examiners after the second reading, was committed.

The Abertillery Water Board Bill was brought from the Lords and read the first time.

A petition was presented by the Edenbridge Parish Council for dispensing with Standing Orders in respect of the Edenbridge Gas Bill.

A petition was presented for an additional provision in the Walsall Corporation Bill, and referred to the Examiners.

The West Kent Electricity Company, the Croydon Corporation, and the Woolwich Borough Council withdrew their petitions against the South Suburban Gas Bill.

The petition of the Port of London Authority against the London County Council (General Powers) Bill was withdrawn.

It was reported in both Houses that the Standing Orders in respect of the additional provisions in the South Suburban Gas Bill and the Middlesbrough Corporation Bill had not been complied with.

SKEGNESS GAS BILL.

HOUSE OF LORDS COMMITTEE.—Friday, March 20.

(*Before Lord* HAVERSHAM (*Chairman*), *Lord* ABINGER, *Lord* OROMORE, *Lord* TEMPLEMORE, *and Lord* LOVELACE.)

This Bill proposes to reincorporate the Skegness Gas Company as a statutory concern, to grant additional capital powers, &c.

Mr. G. J. TALBOT, K.C., and Mr. KEEN appeared for the promoters; and Mr. J. D. FITZGERALD, K.C., and Mr. W. J. JEEVES represented the Skegness Urban District Council, the only opponents.

Mr. FITZGERALD applied to the Committee to hear the Skegness Council's Bill, which was on the list after the Company's Bill, first. He explained that the Council's Bill asked for compulsory purchase powers; and if these were granted, there would be no need for the Company's Bill.

Mr. TALBOT objected to what he termed an unheard-of proposal. It would simply mean that he would not be able to place his Bill before the Committee, and the question of whether the Company should be purchased would be determined without the Committee knowing the contents of their Bill.

The CHAIRMAN said the ordinary course had better be pursued.

The Company's Bill was therefore proceeded with.

Mr. TALBOT, in opening, said the objects of the Bill were to reincorporate the existing limited liability Company as a statutory concern, and to raise new capital in order to meet the considerable extension of demand which was taking place. Another object was to authorize the Company to acquire from Lord Scarborough the freehold of the

site upon which the gas-works now stood. So far the parties had not been able to agree a price. The clause merely provided that the matter should be dealt with by arbitration; and Lord Scarborough did not object to this. At present the land was held on a lease which expired in 1977. The Company was incorporated in 1877 for supplying gas in Skegness and Winthorpe, and continued as a non-statutory company until 1902, when an application was made for a Provisional Order, which was granted. This authorized an additional £13,750 of capital, of which £6000 was to bear a maximum dividend of 10 per cent., £5000 seven per cent., and the remaining £2750 was loan capital. The maximum price was then fixed at 5s. 3d.; and the promoters had continued as a maximum price Company until the present time. As a matter of fact, the Order of 1902 contained the provision that the Board of Trade could introduce a sliding-scale at the end of three years if they thought fit to do so; but this had not been done. In 1907, the business of the Company had developed to such an extent that it was necessary to go again to the Board of Trade for a further Provisional Order, for power to raise £16,000 additional capital, £12,000 of which was to be 7 per cent. maximum stock. The first proposal of the present Bill was to consolidate the capital into a uniform 5 per cent. stock; while additional capital powers to the extent of £51,607 were asked for. This would carry the Company on for about twelve years, on the basis of the present rate of development. In the last eleven years, the sale of gas had multiplied 3½ times; and during the past ten years the average annual rate of increase had been 11·87 per cent. Under the sliding-scale in the Bill, the standard price would be 3s. 6d. per 1000 cubic feet compared with the existing maximum price of 5s. 3d. The present charge for gas was 3s. 9d.; but a reduction to 3s. 6d. would come into force on April 1. The slide, as usual, with 5 per cent. stock was 1s. 8d. per cent.—2s. 6d. increase per £100 for penny reductions in price. The Bill proposed a calorific test instead of an illuminating power test. As in the case of so many other Gas Bills this session, however, it had been arranged to leave a decision on this matter over until the hearing of the Gas Light and Coke Company's Bill, when the whole question would be threshed out. Dealing with the only petition against the Bill—viz., that of the Skegness Council—Counsel discussed first the question of purchase. The Council said that, because the Company were willing to sell in 1900, they should now be compelled to sell. In 1900, however, the Company was a non-statutory one; and although certain negotiations took place for a sale of the gas undertaking in that year—the figure mentioned being £12,000—these negotiations fell through. The idea was not revived in any shape or form until 1911. In August that year, the Council wrote asking for terms of purchase; but the Company's answer was that they did not contemplate a sale. The result was that the Council now came to Parliament in order to expropriate the Company. Hitherto the relations between the Company and the Council had been of the most cordial character; but since the refusal of 1911, there had been a very considerable change. The Council took every opportunity of attacking the Company, and had embarked upon some unsuccessful litigation against them. The Council had one cause of complaint; and that was as regards the Company's Manager. He resigned in 1912, and the Company had not yet fully recovered from his mismanagement. He agreed that there were real causes for complaint against the Company during the latter part of the period this Manager was in office. The Council asked for a testing-station. What had actually been done was that, by agreement, the Company installed jet photometers—a course which was often adopted by small companies. In 1912 the Council asked for the installation of a statutory testing-station. This request was complied with; a testing-station being installed. It was ready and equipped in October, 1912. On the very first day the Council took a test, it, not unnaturally, revealed that the gas on that day was below standard; and a summons was taken out against the Company. This was dismissed on the ground that the test was not taken under normal conditions; but inasmuch as the gas was found to be under standard, no costs were ordered to be paid to the Company. The Justices held that, had the test been continued, the proper candle power would have been registered. The Council next got a number of ratepayers to take the Company to Quarter Sessions, alleging that money which ought to have been put to reducing the price of gas had been used in other directions. An accountant was appointed; and he reported, after investigating the books, that there was no ground for the allegation. The application was therefore dismissed, and the Company's costs were allowed. Following this, in 1913, the Company applied to the Board of Trade for leave to use an improved test burner—the "Metropolitan" No. 2 burner. An inquiry was held, and the Council opposed—asking for concessions in the matter of prices for public lighting and also for ordinary consumers. The Company argued they could not afford this. On the suggestion, however, of the Board of Trade Inspector, Mr. Roper, the Company offered to reduce the price for public lighting to 2s. 9d. The Board of Trade subsequently gave the Company an unconditional Order permitting the use of the No. 2 burner, with a recommendation to them to keep open their offer to reduce the price of gas for public lighting. The Council then accepted the Company's offer, which applied to public lighting, public offices, &c., for three years from July, 1913. The previous price was 3s. 6d. These seemed to be the only reasons put forward to justify the Council asking for purchase powers. It was not usual to give compulsory purchase powers unless a company had been carrying on its business negligently. In this case, nothing of the sort could be alleged; and the Company did not desire to sell. The Council also objected to the other proposals in the Bill, on the ground that they were all to the advantage of the Company and not the consumer. In regard to this, Counsel called attention to the introduction of the sliding-scale, which was expressly designed to protect consumers, and, further, many of the other matters objected to were Model Clauses. Complaint was made that the Company did not propose to extend their area of supply. The point of this was that the area of supply in the Council's Bill included the parish of Croft, outside Skegness, which was at present all fields. If, however, the Committee decided that this should be added to the Company's area, there was no real objection to it.

Mr. *E. J. Brockway*, the Engineer, Manager, and Secretary of the Cleethorpes Gas Company, and Consulting Engineer to the Skegness Company, gave evidence. The output of gas in 1902 was just over 8 million cubic feet. In 1913, this had increased to 27½ millions, and the great bulk of the increase was in the private consumption. This growth was being maintained; hence the necessity for the present Bill. The estimated capital expenditure included £28,800 for plant extensions, £4941 for mains, and £15,600 for services, stoves, meters, &c. This was on the basis of an output of 100 million cubic feet per annum—an output he anticipated in twelve years. The present average consumption per consumer was about 22,500 cubic feet per annum. With regard to the jet photometer for testing, the one employed for some years at Skegness gave quite good results when the same coal was being used year in and year out; but it was not reliable where the gas was carburetted water gas, or where it was enriched by benzol. However, this was not done at Skegness. Moreover, when the Council asked for a statutory testing-station, it was put up in October, 1912. He failed to see what complaint could be made in this connection. As to general complaints, there had only been two which had been brought to his attention. One complaint was as to pressure at a laundry; but a test showed a drop of only 2-10ths. Another was as to smell from the works. An investigation showed that one of the purifier valves was not closing properly, and was allowing a small quantity of unpurified gas to bye-pass the purifier, and this got into the mains. This was soon rectified. Since the Council appointed a gas examiner, the reports had always been that the gas was up to the full pressure of 3 inches, and free from sulphuretted hydrogen.

Mr. FITZGERALD, cross-examining on the question of mismanagement, said it was agreed the mismanagement had affected the profits. Consequently, added Counsel, the consumer suffered. Witness said he had reported verbally two or three years ago that the works were badly managed. He agreed that, in spite of the bad management, shareholders had received their full dividends, and that the whole of the effect of the bad management fell on the consumer. The question of the amount of unaccounted-for gas was next discussed. Witness said 7 to 9 per cent. was an average figure; and it was put to him that for many years this figure had been greatly exceeded—running up to from 16 to 20 per cent. At the Cleethorpes works it was only 3 per cent. Attention was also called to the fact that at Cleethorpes the value of the residuals represented 65 per cent. of the cost of the coal; whereas at Skegness for many years the figure had been very much less, although it was gradually improving. It was agreed that this was due to bad management; but it was being slowly rectified. Witness said the Directors were too lenient with the Manager while this state of things existed; but he denied that there had been any complaints as to the candle power of the gas. Counsel remarked that the Council had specially asked for a testing-station on account of receiving 140 complaints; but witness contended that these were canvassed for. As to purchase, Counsel suggested that the present was a favourable time; the capital powers of the Company being practically exhausted. But witness said the Company did not wish to sell.

Mr. *R. G. Shadbolt*, Resident Engineer, Manager, and Secretary of the Grantham Gas Company, said that the capital powers asked for were imperative. The purifying plant and gasholders had been recently enlarged. The former now had a margin of about 30 per cent. over the 1913 make; the carbonizing plant had a margin of 10 to 15 per cent., which was not too much; the condensing plant was deficient by 18 to 20 per cent.; while the washing and scrubbing plant was about equal to the present requirements. At the end of 1913, the slot consumers had an average consumption of 13,867 cubic feet per annum, and ordinary consumers 43,768 cubic feet. Taking a 3½ multiplier for the rate of increase, there would be a total of 69 million cubic feet extra consumption at the end of twelve years, or a total of 96,600,000 cubic feet, which was very near the 100 millions assumed by Mr. Brockway. The figure of £750 per million for capital expenditure was a moderate one; but he thought it could be done for that. As to the manner in which the Company had catered for the district, it was pointed out that there are 1225 houses in Skegness, and the Company had 1132 consumers. The only complaint which he had to make against the Skegness gas, as a visitor to the town, was that it was too heavy for present-day mantles, with the result that there were at times slight smells in the houses due to the improper adjustment of gas and air on the fittings. The standard price of 3s. 6d. was as low as the Company should be asked to go. He had a list of 22 undertakings with similar makes to that at Skegness, and in every case but one the standard price was higher. The one case was Uttoxeter, which was 3s. 2d. Generally speaking, the Company had done their duty well. The price in twelve years had been reduced by 30 per cent.; while the yield from residual products had shown distinct advances in prices since 1902. Other evidence of improvement in the Company's operations, said witness, was in the decreasing amount of unaccounted-for gas, which last year was only 6·71 per cent., which he did not think bad. There was no reason why the Company should not be allowed to continue in existence. He did not think any good purpose would be served by transferring the undertaking to the Council. Certainly the consumers would not benefit; and this was the chief consideration. The condition of the plant and works generally was very good. The capital charges involved in a sale would represent a very large addition to the costs of the Council, and would tend to increase the cost to the consumer.

Mr. FITZGERALD, in cross-examination, said the promoters had taken the results of the undertaking in 1902, and argued that since then there had been a distinct improvement, whereas the figures of 1902 were disgraceful. Witness, however, would not agree that the figures of 1902 were disgraceful. Indeed, for a works of the size they were not bad, though they were not so good as would be expected to-day. Counsel went on to question witness as to the effect of the passing of the Bill upon the purchase price of the undertaking in the future; and it was agreed that, if the profits increased in years to come, the value of the undertaking would also increase. The point seemed to be that nothing should be done in the Bill which would tend to increase the value of the Company's undertaking from the point of view of a possible sale in the future. Another matter taken up was the percentage increase in the Company's business. Counsel remarked that during the last two years the increase had been less than in the

previous few years; but it was pointed out that, taking the average for the past five years, a higher rate of increase existed than during the ten years the figure regarding which had been adopted by the promoters in framing their estimates for the next twelve years. Witness did not consider the present capital expenditure of £1092 per million cubic feet a bad one, having regard to the character of the undertaking.

Mr. *Brockway* was recalled in regard to the proposed extension of the works. This will consist of a vertical retort installation, coal-store, annular condensers, tower scrubbers, exhausters, and exhauster-house, purifiers, boiler-house and boilers, gasholder, workshop, sulphate plant, &c. The existing holder tank is to be converted into a tar and liquor tank, and the existing holder will be telescoped.

Mr. *Henry Woodall* gave similar evidence to that of the previous witnesses. He had worked out figures of the future demand on the basis of 10 per cent. increase. Taking the capital at £750 per million, the amount asked for under the Bill would carry the Company on for thirteen years. He regarded the standard price of 3s. 6d. as a reasonable one, and anticipated that the price of materials, labour, &c., would go down in the future. There was a distinct tendency in this direction in practically everything except coal. As to the purchase of the undertaking, he saw no conditions in this case which would justify this course, and did not think it could benefit either the shareholders or consumers. There was every reason to anticipate that the Company would continue to improve and carry out their obligations in a satisfactory manner.

Mr. FITZGERALD cross-examined on the question of purchase. It was agreed that there had been cases of transfers by compulsion, but only where grave irregularities were shown. Counsel reminded witness of the Swinton and Mexborough case, where a compulsory purchase clause was granted. There the conditions were similar to Skegness—viz., a large amount of unaccounted-for gas. The shareholders, it was agreed, received a larger price than their shares ever sold at. But there had been no reduction in the price of gas, said witness; and so the consumers did not benefit.

Re-examined, witness said there were many more cases in which compulsory purchase powers had been refused than granted. Only the previous week such powers were refused in the Leyland case.

Monday, March 23.

The proceedings were resumed this morning.

Mr. *William Cash* said the financial provisions in the Bill were on the usual lines. The adoption of a sliding scale by the Company was contemplated in one of their Provisional Orders. It would be an advantage to the consumer, inasmuch as the consumer's advantage in any reduction of price was as 5 to 1 compared with the increased dividend to the shareholders. At present the Company had practically no further capital powers. The returns on the converted capital would be the same as on the existing stock; the Company having paid maximum dividends during the past eight years. Witness was proceeding to deal with the practice of Parliament in regard to compulsory gas purchases, when

Mr. FITZGERALD objected, on the ground that the witness was an accountant. Furthermore, the practice of Parliament was to deal with each case on its merits.

The CHAIRMAN thought there could be no objection to the matter being discussed.

Witness, continuing, said he only knew of one case in which compulsory purchase powers had been granted over a statutory concern against its will. In that case, however [Mexborough and Swinton], there were very grave complaints against the Company. It was alleged that the accounts were badly kept, that there was heavy leakage (amounting to 40 per cent. and getting worse), there was a very poor make, with decreasing sales due to electrical competition, there was no supply to prepayment meter consumers, there had been no reduction in price for twenty years, and the reserve fund was in excess. None of these things applied to the Skegness Company.

Mr. FITZGERALD cross-examined on this point. While agreeing that if the arbitration price was a fair one the shareholders did not lose much, witness disagreed that there was any other case of a statutory company where there had been granted a compulsory purchase clause. Counsel suggested that other cases were Loughborough, Chesterfield, and Pontefract.

The Company's Counsel and witness would not agree to this, although it was admitted that there had been cases in which compulsory purchase powers had been inserted in Bills by agreement. It was suggested to the witness that a maximum-price company were likely to get a higher price than a sliding-scale company; but this view was not accepted.

Mr. TALBOT, re-examining, pointed out that in this case the Company were doing the contrary to what was suggested in the Council's petition. There the Company were charged with trying to inflate the price; but if Mr. Fitzgerald's contention was right, this could hardly be substantiated, as it was now proposed to apply the sliding-scale.

Mr. *J. H. Salmon*, the present Manager of the Skegness Gas Company, said he was appointed on Nov. 1, 1912, and found the plant good; but it had been neglected, and there were traces of bad management all round. Considerable improvement had since been effected; and to quote an instance he mentioned the unaccounted-for gas, which was now 6·7 per cent. There had also been an improvement in the make per ton of coal carbonized. He calculated that the works had been put into working order by May of last year.

Mr. FITZGERALD, in cross-examination, dealt with unaccounted-for gas. Witness said it had not been necessary to spend a large sum of money on mains during 1913, owing to the fact that the enormous leakage was mainly due to four broken mains, which were very easily repaired. The gas used on the works was shown in the accounts as 911,000 cubic feet; but this should be more accurately put down as "used on works, houses, offices, &c." In his own house, for instance, he consumed 60,000 cubic feet per quarter, because the house was used for the benefit of the Company as well as himself. The house was fitted throughout with gas, and was used for demonstrating to consumers the various uses of gas. The rental value of his house was £28 per annum; but it was specially fitted for the purpose he explained. Counsel next alleged that the roads were frequently opened without notice. Witness said that arrangements were made with the Council to reinstate the roads; and although it might be true that on a few occasions they were opened without notice, for small matters, the Council always had notice as to reinstatement, and payment had been made. Incidentally, witness said that much trouble had been caused by the previous bad management. When he went to Skegness, things were in a very chaotic state. Many books and papers had been destroyed. It had taken him a long time to straighten matters out; but he believed he had to a large extent succeeded. Counsel also complained that the street lighting meters at one time had to be changed on account of their registering too much gas. A discussion on this point, however, revealed the fact that at any rate one of the meters was registering too little.

Mr. *Maynard Page* (of Messrs. Tweed, Stephen, and Co., Solicitors and Secretaries to the Company) said the capital expenditure was about £30,000, in addition to £3000 premiums. There was also a sum of £1415 over-spent on capital account. The circumstances of the proposal to purchase the Company's undertaking in 1900, already referred to in Counsel's opening speech, were detailed. The correspondence seemed to show that the negotiations for the purchase were not proceeded with because of the burden it would impose upon the ratepayers. Since then nothing more had been heard as to purchase until 1911, when the Council asked the Company upon what terms they would sell their undertaking. The answer was that they could not entertain the question; and the whole matter dropped. Witness also mentioned that his firm had acted as Solicitors to the Gas Company since its inception in 1877, and seven years later were appointed Solicitors to the Council also. This position was maintained, with the full knowledge of the Council, for a number of years; but subsequently the Council appointed a resident Clerk. It was since then that the relations between the Council and the Company had become strained.

Mr. FITZGERALD, cross-examining, said that no corruption was suggested against the witness's firm during the period they were acting in the dual capacity of Solicitor to the Company and Clerk to the Council; but he put it as an undesirable state of things at the time of the proposed purchase in 1900 and at other times when the Council were complaining to the Gas Company about certain matters on behalf of the consumers. Counsel then called attention to the fact that the Company's reserve fund of about £600 had never been invested, in accordance with the Gas-Works Clauses Act, and that witness, in his dual capacity, had not drawn the attention of the Council to the fact. Witness said he saw no need to bring these matters to the Council's notice.

Mr. *John Cumming*, a builder and late member of the Urban District Council, spoke as to the possibilities of development of Skegness. He was against purchase of the gas undertaking.

Mr. JEEVES cross-examined to the effect that the Council had purchased the local water undertaking.

The CHAIRMAN did not see this had anything to do with the case.

Witness, in answer to further questions, said he did not believe the Council could sell gas as cheaply as the Company. In any event, he would rather the Company ran the risk of the undertaking than the Council.

Mr. *J. Dunkley*, the Chairman of the Skegness Gas Company, was next called to answer any questions from the Counsel for the opposition.

Mr. JEEVES asked as to the management of the Company, which witness said was, in his opinion, as good as most similar undertakings. He admitted that the Consulting Engineer had reported from time to time as to the conduct of the late Manager. The point was, said Counsel, that the Board of the Company had been negligent in not taking a more drastic view of the conduct of the Manager, with the result that the consumers were not receiving the gas at as cheap a price as they might, whereas shareholders were all the time receiving the full dividend.

In answer to the CHAIRMAN, witness said that no offer had been made by the Council in connection with the present Bill. He thought £12,000 was a fair price in 1900; but it would have to be treble, or even more now.

The CHAIRMAN: That would be a very serious thing for the ratepayers.

Mr. *James Cownall*, a resident of Skegness, spoke as to the satisfactory gas supply given by the Company, and also expressed himself against the idea of purchase by the Council.

Mr. *E. J. Crofts*, another resident, gave similar evidence.

This concluded the case for the Bill.

Mr. J. D. FITZGERALD said he proposed to open the gas part of the Council's Bill, and would confine himself to the question of the purchase of the Company's undertaking. He did not deny that if the concern was to remain in the hands of the Company more capital would be required; but the real point was as to the purchase of the undertaking on arbitration terms, as provided in clause 6 of the Council's Bill. The proposed purchase was to take place under the Lands Clauses Act, which was generally recognized as giving the best terms to the seller, as opposed to the terms of the Arbitration Act. Compensation was also to be given to the Company's officers, if they were not retained. Thus there would be no hardship either to the shareholders or officers. The maximum price in the Council's Bill was 4s., compared with a standard price of 3s. 6d. in the Company's Bill. The maximum price, however, was never understood to be the selling price; and no doubt the local authority would be able to sell below this figure. On the other hand, a standard price was the one at which it was expected the Company could sell, if it were properly managed. In practically all the large towns of the country the local authorities now managed the undertakings. This was so at Birmingham, Leeds, Bradford, Glasgow, and elsewhere; and in all cases the transfer had resulted in an increased supply of gas and a reduced price. He did not know of any case where substantial mismanagement was proved that the local authority had not been allowed to purchase.

Certainly it had never been his lot to hear a case of such substantial mismanagement as had been proved against the Skegness Company. The substantial facts in this case were admitted. On Mr. Brockway's evidence the works had been seriously mismanaged, to the detriment of the consumers; while the shareholders had been getting their maximum dividends. The Company had been using South Yorkshire coal; and from this there should be no difficulty in obtaining from 10,500 to 11,000 cubic feet of gas per ton. The Company, however, had only been getting 7000 to 9500 cubic feet. Even at the present moment, when the new Manager had been installed for some eighteen months, the figure was only 9500 cubic feet.

Mr. TALBOT: That is inaccurate. The present figure is 10,800 cubic feet.

Mr. FITZGERALD said he was dealing with the figures for 1913. The figure just mentioned had not been given in evidence. Continuing, Counsel called attention to the small returns from residuals, which should represent some 60 to 65 per cent. of the cost of the coal; whereas it had varied from 25 to 46 per cent.

The CHAIRMAN: But there was a very considerable improvement in 1912.

Mr. FITZGERALD then dealt with some of the other points covered in cross-examination—such as the desirability of there being only one authority in a town authorized to break-up the roads. The Council had acquired the water undertaking belonging to Lord Scarborough; and in spite of having to pay a substantial price for it, had been so successful in their management that the rates had been reduced and a profit made. This showed that the Committee were dealing with a competent body who had already successfully managed a concern quite as valuable as the gas undertaking. In addition, there was the strongest possible feeling in the town that the gas-works should be in the hands of the local authority. If a purchase was ever to take place, now was surely the time, as the Company had, so to speak, come to the end of their concession, inasmuch as their capital powers were exhausted. A large amount of money would admittedly have to be spent on the gas undertaking during the next ten years—though the Council anticipated it would be less than the amount suggested by the Company; and this money could be raised at a lower rate by the Council than by the Company. The Council were now raising money at 3½ and 3¾ per cent.; whereas the Company had been borrowing at 4¾ per cent. Certainly ordinary capital could not be raised at less than 5½ per cent. The town was increasing rapidly—not due to anything the Gas Company had done; and the Council should have the advantage of the increase in the direction of being allowed to take over the gas-works and supply gas at a cheaper rate than at present. Some criticism had been levelled at the proposal in the Council's Bill to include the district of Croft; but evidence would be given that some large building estates were about to be laid out in the district which would require a supply of gas.

Tuesday, March 24.

Mr. *E. H. Stevenson* said that the works of the Company were quite good, and there was no reason why first-class working should not be effected there as they existed. There was sufficient margin in most portions of the works to carry the Company on for quite a little while—certainly until the Council took them over, should they be granted purchase powers. The only opponent to the Council's Bill was the Gas Company. Purchases of this sort took place on the maintainable value in the case of non-statutory companies, or of the divisible profits in the case of a statutory company; but the price asked in 1900, of £12,000, was most exorbitant—indeed, he had never known of a similar case. It meant no less than 71 years' purchase of the profits earned in 1900; and it would have been most improper for the Council to have paid this sum. He believed that if the Council had known in 1900 that if they had applied to Parliament and asked for a purchase clause to be put into the Gas Company's Provisional Order such a clause would have been put in, as it undoubtedly would, they would have gone on with the matter and purchased the works under arbitration. But the Council did not have that knowledge, as they had not had any expert opinion at that time. With regard to the test at the time the new testing-station was put up, to which reference had been made, he disagreed that a testing-station was not ready for an accurate test immediately the apparatus was fixed. There could be no question of the absorption of gas in the pipes, which were of wrought iron or steel. The only thing that could in any way militate against the test was the presence of air in the pipes; but this would have been driven out in two or three minutes. It was a common thing to send a portable testing apparatus round in order to take tests, and perfectly accurate results were obtained immediately the apparatus was fixed.

Mr. TALBOT, on behalf of the Gas Company, objected to this matter, and also the action at Quarter Sessions relating to the accounts of the Company, being gone into, as it was past history, which witness had no knowledge of. Furthermore, the decisions had been given in each case; and the matter must stand.

The CHAIRMAN said he did not think it was necessary to go into these matters.

Witness, continuing, said that the consumers had substantial and solid grounds for complaint as to the management of the Company. The quantity of coke usually amounted, in works of a fair size, to nearly 10 cwt. per ton of coal, and in works of small size, to 9 or 8½ cwt. per ton of coal. The quantity sold by the Company from 1902 to 1912, however, only averaged 5½ cwt. Figures were also given with regard to the tar and liquor produced between 1902 and 1910, which showed that 1904 was the only year in that period in which there was approximately the right amount produced, and that the amount was far below what it should have been in the other years. In 1911 and 1912, there was approximately only half the quantity returned that should have been returned. As to sulphate, in 1911 there were 19 lbs. made per ton of coal, which was fair on a small works, but not good; but in 1912 and 1913 this quantity fell to 10½ and 11½ lbs. respectively. In no year, with the exception of 1904, had there been a proper return of residual products; and in that year the Company did not sell anything like the quantity of coke that they should have done. He had made comparisons with various gas-works in Yorkshire—this district being preferred because the Skegness Company used more or less the same Yorkshire coal, which, being the very best gas coal, should have produced good results. The comparison showed that the average production of coke was 9 83 cwt. per ton of coal, or more than 4 cwt. in excess of that produced at Skegness, and that the results as a whole were much better than those obtained at Skegness. The sale of residual products had been excessively bad during the whole history of the Company, with the exception of the last year, when the quantity of coke and tar was reasonable. This naturally affected the income of the Company, and the consumers had been paying more for their gas than they should have done. The price of coal was fairly high. The Company were quite right in getting the best; but they should get out of it the best results. In 1913, the quantity of gas sold was 9645 cubic feet per ton of coal carbonized. This, he considered, was 1000 cubic feet deficient. The quantity of coke which the Company said they made, and the quantity of tar and liquor made, was, for the four years ending 1912, exceedingly short for the weight of coal used. The products ought to weigh out very nearly the same weight as the coal. In 1912, according to the Company's returns, 27 per cent. of the coal carbonized was lost; whereas this should have been about 5 per cent. In 1913 the loss was 8 per cent. At Hunstanton, where witness acted as Consulting Engineer to the gas-works, the loss was only 4½ per cent. At Skegness the capital per million cubic feet capacity was very high; and the Company expended more capital for the business done than most companies. The capital expended per million at present was £1090, compared with £928 in 1906. Considering that the works had been extended, he maintained that there should have been a decrease rather than an increase. He had also made a comparison of the Skegness works and the Hunstanton works, which had been taken over by the local authority. Although Hunstanton was not so favourably situated as Skegness as regards the supply of coal—the prices being 20s. 1d. and 18s. 5d. per ton respectively—and the quantity of gas sold at Hunstanton was only three-quarters the quantity sold at Skegness, it had shown much better results, and had charged much less for gas; this being due to the thoroughly capable way in which the Hunstanton works were managed. The Skegness works were the worst-managed he had come across. The average price of gas supplied by local authorities was lower than the average price charged by companies. In every case of which witness knew where bad management had been proved against a company, the company had been compelled to sell—indeed, in some cases where Parliament had sanctioned the compulsory purchase of a company there had been no complaints at all by the consumers against the company. There was no foundation for the suggestion that the shareholders of the Company would not reap the full benefit of all their endeavours in the past. As a matter of fact, they would get such a sum as would give them a larger income than they were receiving now, which would not be the case if the Company remained the gas authority, owing to the fact that the full dividends were being paid.

The CHAIRMAN said the Directors of the Company thought they would not be so well off.

Witness replied that anyone familiar with arbitration proceedings would know that they would be better off. In addition to not hurting the shareholders, it would be an absolute benefit to the consumers if the business was transferred. It had been said by the Board of Trade that the Company had to look to their shareholders, and that the consumers had no voice in the matter. There was also no foundation at all for the suggestion that the undertaking would be a burden upon the rates if it was taken over by the Council. He did not know of an instance where an undertaking had been bought by arbitration in which this had been so. On the contrary, in practically every case there had been a considerable reduction in the price of gas.

Mr. KEEN, in cross-examination, said that if the Council had the management of the undertaking they could charge the maximum price in the Bill, which was 4s, irrespective of the rate at which they might borrow money. If, on the other hand, the Company managed it, they could not charge more than 3s 6d. under the sliding-scale, unless they at the same time made a reduction in the dividends.

Witness said that they would have to put up with the price fixed by arbitration. Continuing, he said that, apart from the bad management of the Company, he would not advocate that the undertaking should be compulsorily bought.

Mr. KEEN said that, in spite of bad management, the Company had been able to reduce the price in twelve years from 5s. to 3s. 6d. per 1000 cubic feet, which was a very advantageous result; but witness held that this was not due in any way to the management, but to the growth of the district, and consequently of the undertaking. Speaking with regard to the comparison made by witness between various gas undertakings in Yorkshire and Skegness, Counsel pointed out that, among others, Sheffield, Leeds, and Bradford, whose outputs ran into three figures of millions, were included, and therefore the comparison was not on a fair basis. In spite of this, however, the yield of tar at Skegness in 1913 was higher than the average yield of the Yorkshire companies in that year, which was, in his opinion, creditable. Witness, however, said that this was because the Skegness Company made less gas per ton of coal. The object of a gas undertaking was primarily to make gas, not to yield tar. As to the security that the undertaking would be better managed if carried on by the Council than it was by the Company, witness said that if it was not managed properly in the hands of the Council they would be replaced by their constituents. The inhabitants of the district would have full control over their gas supply; but at the present time they had none whatever.

Mr. *Frank Jones* said that, in his opinion, the working results of the Company during the past eleven years had been very poor. There must have been something radically wrong. He had seen the works, and they were very good; and it naturally followed that if the Company had been properly managed the price of gas would have been much lower. He pointed out that the Company did not supply free installations to slot-meter consumers, except a cooker, which showed want of business foresight. The slot gas-meters supplied, however, were mostly shilling-in-the-slot. There were very few penny-in-the-slot meters, which were the kind needed for very poor consumers.

Mr. KEEN, in cross-examination, said that the Company supplied a

cooker and free burners to slot-meter consumers for an extra charge of 2½d. per 1000 cubic feet, which he suggested were very generous terms indeed. Witness said that the South Metropolitan Gas Company, of which he was a Director, charged 9d. extra per 1000 cubic feet to prepayment consumers. For this they supplied all the fittings needed in a house; and the money spent by the Company in a slot-meter consumer's house in supplying fittings was three times that spent by the Skegness Company.

The CHAIRMAN asked to what did witness attribute the improvement in the Company's supply in 1912 and 1913.

Witness: To the new manager.

It was rather a substantial improvement?—It is not such a big improvement as it appears, having regard to the bad figure originally.

Mr. *G. H. Randall*, the Chairman of the Urban District Council, dealt with the various points put in the cross-examination of the witnesses on behalf of the Council, and spoke as to the large number of complaints the Council had received regarding the gas supply. Special reference was also made to a dispute between the witness and the Company some five or six years ago, in which the Company had changed one of his meters and had made no register of the change, with the result that the next bill was ten or fifteen times more than the same period of the previous year. After much trouble, however, the matter was finally rectified. He also referred to the electricity powers sought by the Council, and to the additional power to transfer the undertaking to a Company if desired. It was not the intention of the Council to do this at present, although it was thought a wise thing to have the provision included.

Eight local witnesses were then called, and gave details of various complaints which they had made from time to time as to the quality and pressure of the gas, and also difficulties in obtaining a supply. These included two hotel proprietors, a music hall proprietor, and a picture hall proprietor.

Mr. *S. G. Randall*, the Chairman of the Finance Committee, pointed out that Skegness was very favourably situated in the matter of rates compared with a large number of other seaside towns, and that these had been reduced successively during the past three years.

Wednesday, March 25.

On the resumption of proceedings this morning,

Mr. *R. H. Jenkins*, the Surveyor to the Skegness Urban District Council, testified as to the bad administration of the Gas Company since 1912, when he first held his present position. He always made a rule of sending to the Gas Company a list of places where street works were being carried out by the Council, so that if the Company had any alterations or any other works to carry out they could do so while the road was broken-up; but in nearly every case the Council's works were well in hand before the Gas Company took any action. Perhaps one reason for these delays was that the staff was quite inadequate for the work to be carried out. In regard to the breaking-up of streets by the Gas Company, after these had been completed the Council repaired the surface—claiming the sum due for this from the Company. The Company, however, very often failed to send in notice to the Council that the works were contemplated, thereby causing great inconvenience. He also referred to a case where a number of meters were ordered by the Council to be tested. These had been sent to the testing-station at Nottingham; the result being that only two were approved and four were rejected, owing to the fact that the amount of gas registered was more than was consumed. The Council complained of the delay in sending the meters to Nottingham, and also in getting them back.

Mr. KEEN, in cross-examination, secured the admission from the witness that these meters were, of course, substituted by others, and therefore maintained that no inconvenience was caused by the delay. With regard to the trenches made by the Company, witness said that if notices were not sent to the Council he could not see whether the trenches were filled in properly, or whether they had settled properly before the surface was restored.

Mr. FITZGERALD, in re-examination, said that under the Gas-Works Clauses Act the Company had no right to break-up streets without giving three days' notice to the Council, except in cases of emergency. The Council were also entitled to have a plan showing where the mains were to be laid; and he submitted that the Company had disregarded these statutory obligations altogether.

Witness said he would not stand out necessarily for three days' notice from the Company, so long as he got reasonable notice, and knew what was being done.

Mr. FITZGERALD, in addressing the Committee, said that the real question to be considered was whether there had been substantial mismanagement of the Company extending over a long period. He expressed the opinion that the undertaking had been scandalously mismanaged; and it was the duty of the Directors to put a stop to this. Instead of dismissing the old manager, which appeared to him to be the proper course, they had allowed him to remain for eight years, and then he left because he had secured an appointment elsewhere.

Mr. KEEN said the evidence was that if he had not left he would have been asked to resign.

Mr. FITZGERALD, continuing, said it had been proved that there had been mismanagement in the carbonization of coal, the production of residuals, and in purification. When the new manager took up his duties, he found that the purifying plant was choked with tar and very dirty, and the gas could not be properly purified. Skegness depended to a large extent for its prosperity on its reputation as a health resort; and this reputation could not be kept up while the gas undertaking in the district was being run on such lines as it had been. A hotel proprietor had stated that the gas gave a bad light, and people staying at his hotel had asked for candles to enable them to see properly in their bedrooms, and had threatened to leave owing to the smell of the gas. The light given from the gas was such as only to make darkness visible. In support of the Council's application to take over the undertaking, he related his own personal experience when an eminent gas engineer was advising him to purchase some shares in a certain gas company—one of the reasons given being that it was not unlikely that the company would be taken over by the local authority.

Mr. KEEN, on behalf of the Company, said that the onus rested upon the Council to show that there was some overmastering reason that, in the interests of the public, the owners of the concern should be deprived of their property in the way suggested. Under the Public Health Act of 1875, a local authority was authorized by Parliament to carry on gas-works; but the exception was made that they must not do so where there was a statutory undertaking authorized to carry on such works. It had become the practice that when a company had not obtained statutory powers, but were coming to Parliament for the first time for this purpose, then at that stage it was usual for Parliament to allow the local authority to step in and discharge the duty of supplying gas. But it was not so in this instance. The Skegness Council were given an opportunity to purchase, but had refused, on the ground that the price was too large. It had been suggested that, as the Secretary of the Gas Company was also the Clerk to the Council, this had militated against the purchase being made. He ventured to suggest that this was erroneous—in fact, under the circumstances, he thought things would have been made easier for this reason. The price asked by the Company for the undertaking was £12,000, which was said to be unreasonable. Even so, the price might have been settled; but the Council did not go any further in the matter. He did not think Parliament should allow the undertaking to be bought now against the will of the Company. There were a much larger number of gas undertakings in the hands of statutory companies than local authorities. There had been full criticism brought to bear against the Company; and there was a suggestion that consumers had grumbled before 1912, although the evidence of local witnesses had only gone back as far as 1912. But he submitted that there was no more complaint in this case than in most places where there were small undertakings of the kind. The Company was a small one, and therefore not able to have such expert advice as some companies. With regard to the suggestion that the previous manager should have been dismissed earlier than was the case, it should be considered that 1912 was an entirely different period than before. This had been pointed out by the tables shown by Mr. Stevenson. There was not only the fact that the bad management had culminated in 1912; but in the earlier years the Company had succeeded in reducing the price from 5s. to 3s. 9d., and on April 1 of the present year it was to be further reduced to 3s. 6d. The year 1912 was the first one in which the maximum dividend was not paid; but in 1913 it again recovered itself. It was, of course, not reasonable to get rid of the manager just because the management began to get unsatisfactory, but to find out whether he had any explanation to offer, and whether he was prepared to turn over a new leaf. After giving him a fair chance, however, it was decided to ask him to resign. The new manager had well met the difficulties left by his predecessor, and expected to get on very much better as he went on. There had already been quite a reasonable improvement in 1913. Counsel pointed to the fact that there had been no criticism of the works made by Mr. Stevenson. On the contrary, he had stated that the works were thoroughly good, and there was no reason why good working should not be effected there; and to-day the affairs of the Company were satisfactory. Therefore, there was no foundation for suggesting that either the condition of the undertaking or its management was such as to necessitate its being purchased compulsorily. There was no foundation that the Company would have any better Directors than they had to-day, or that the Council would get a better manager than the existing one—indeed, they might get worse. The undertaking would be saved the cost of arbitration, which would be very considerable, if it was left in the Company's hands. Referring to the opening speech for the Council, it had been stated that evidence would be put forward with regard to including the parish of Croft in the area of supply; but this was not done. The Company were in a position to give this supply; but he submitted that it should not be done until there was a proper demand for it.

After deliberating in private,

The CHAIRMAN announced that the Committee were of opinion that the Company's Bill should be allowed to proceed; and the gas clauses in the Skegness Urban District Council Bill were not allowed.

The Bill was ordered to be reported for third reading.

LEIGHTON BUZZARD GAS BILL.

HOUSE OF LORDS COMMITTEE.—Thursday, March 26.

(*Before Lord* LAMINGTON, *Chairman, Lord* ABINGER, *Lord* TEMPLEMORE, *Earl* WICKLOW, *and Lord* LOVELACE.)

The objects of this Bill, promoted by the Leighton Buzzard Gas Company, are to extend the limits of supply, consolidate the capital, sanction additional capital, distribute the reserve fund in respect of back-dividends, and adopt the sliding-scale and a calorific value test.

For the promoters, Mr. HONORATUS LLOYD, K.C., and the Hon. EVAN CHARTERIS appeared. The only opponents, the Leighton Buzzard Urban District Council, were represented by Mr. BALFOUR BROWNE, K.C., and Mr. G. W. BAILEY.

Mr. HONORATUS LLOYD said that the Leighton Buzzard Gas Company was formed as a private concern in 1835, and was incorporated under the Companies' Acts in 1857. In 1891, it became a statutory maximum price undertaking under Act of Parliament, with an original ordinary share capital of £12,106 10s. carrying a 10 per cent. maximum dividend, additional share capital amounting to £15,000, bearing a maximum dividend of 7 per cent., and a total authorized loan capital of £6750. The maximum price was fixed at 5s. within one mile of the Cross in Leighton Buzzard, and 6s. beyond this. The illuminating standard was 15-candle power. The Act of 1891 also contained a provision that, in the event of the Leighton Buzzard area being formed into a local board district, the Local Board or Urban District Council might apply to the Local Government Board, or by Act of Parliament, for powers to purchase the Company's undertaking;

and the Company were not to oppose the application on merits. This had never been done by the Council, however; and thus for a period of 22 years no steps had been taken in this direction. The whole of the original capital had been raised. Of the £15,000 additional capital authorized in 1891, £9750 had been issued at a premium under the auction clauses, and realized £13,001 8s. There was thus £1998 12s. share capital still unissued. In addition, the whole of the loan capital powers of £6750 were unissued; making the total of share and loan capital unissued £8748. The Company had been highly successful, and had carried on their work without complaint. Representatives from a considerable area beyond the present limits of supply would give evidence that they were so satisfied with the Company's position that they desired a supply of gas from them. Under the Bill power was sought to charge 6d. extra in the new area, as compared with the price inside the existing area. He might mention that although the Company at present had the right to charge a differential rate of 6d. within the existing area, this had never been done; the charge being uniform throughout. At the same time, with regard to the area now proposed to be added, an arrangement had been made in the district of Wing that the price would be reduced to the same figure as that already charged when the consumption reached 2 million cubic feet per annum. As to the consolidation and conversion of capital clauses, these were in common form, and would result in the £12,106 10s. of 10 per cent. stock being converted into £24,213 of 5 per cent. stock; while the £9750 issued 7 per cent. stock would be converted into £13,650 of 5 per cent. stock. Under clause 8 of the Bill, additional share capital to the amount of £10,000 was asked for, with one-third borrowing powers. In clause 16 the Company asked for one-third borrowing powers on the additional capital and one-third borrowing powers on the £1998 unissued capital. The net result was that the Company would be authorized to raise £28,618 additional capital in shares and loans. In clause 10 permission was asked to pay back-dividends out of the reserve fund. Under section 31 of the Gas-Works Clauses Act, 1847, a gas company were entitled to form a reserve fund after making certain other payments. In the earlier years of the Company's undertaking sufficient had not been earned to pay maximum dividends upon the shares. Notwithstanding this, however, the Directors in subsequent years, when the maximum dividends were being earned, instead of paying off the back-dividends, as they were entitled to, had given precedence to the formation of the reserve fund. Under the present Bill, when the sliding-scale came into force these back-dividends would automatically disappear. Therefore, it was asked that, in fairness to the shareholders, Parliament should sanction the use of the reserve fund, amounting to about £1500, for paying off the back-dividends which they could have distributed in years gone by except for a desire to strengthen the financial position of the undertaking. When the Bill was drafted, a standard price of 3s. 6d. was included; but it had since been decided to reduce this to 2s. 10d., which was to be the price charged in the Company's existing area as from April 1. The calorific value test was to be inserted in the Bill after the decision come to in the Gas Light and Coke Company's Bill. The suggestion in the Council's petition was that the Company should be practically kept at a standstill until the Council made up their mind whether or not to bring in a Bill next session to purchase the undertaking. The point to be remembered, however, was that the Company supplied in a large number of districts outside the urban district area; and these outside districts were strongly opposed to another Council supplying them with gas. Furthermore, it would mean that the Urban District Council, which was in one county area, would have powers to supply gas in another county area, as the Company's existing limits of supply extended into two counties. As a matter of fact, immediately the Council heard of the promotion of the Company's Bill they deposited a late Bill asking for powers to purchase. But the Lord Chairman had refused to allow it to be introduced, on the ground that the powers to purchase had existed in the hands of the Council for so many years that it was not right to introduce a Bill at the last moment this session. Counsel could not help expressing astonishment at the statement in the petition that the sliding-scale offered no advantage to the consumer; for surely it was the very basis of the sliding-scale that the consumers and the shareholders were brought into partnership, and only when the price of gas was reduced was it possible to pay increased dividends. It was also asked in the Council's petition that nothing should be done under the Bill to inflate the price of the Company's undertaking, pending the decision as to whether the Council would come with a scheme to purchase; while the payment of the back-dividends out of the reserve fund was also objected to. He protested against anything being done which would tie up the hands of the Company for any considerable period of time, awaiting action by the Council as to purchase, as it would be not only bad for the shareholders but for the consumers if the undertaking was not developed in a natural way. Finally, Counsel referred to a report by the Local Government Board, which called attention to the 6d. extra charge in the new area, and suggested that the Committee should be satisfied that this was equitable. The only other matter of importance raised in the Local Government Board report was to clause 33, dealing with the supply of gas-fittings. This authorized the Company to supply dynamos; and it was suggested by the Local Government Board that it was a novel power. There were, however, cases in which the ability to supply dynamos to be worked in conjunction with gas-engines would be exceedingly useful.

Mr. *R. Richmond*, the Chairman of the Company, said that further capital powers were necessary in order to meet the increasing demands in the district. The actual capital expenditure during the past few years had not been excessive; but this was due to the expenditure upon capital account which was not represented by shares. For instance, the Company found large quantities of sand upon their land. This was sold, and brought in a total revenue of £2206, which was put into the undertaking and did not bear dividends, and so benefited the consumer. Consequently, the capital expenditure per million cubic feet was exceptionally low. It was interesting to note that although the Council in their petition objected to the addition of the outside areas, on the ground that it might entail a loss which would fall upon the consumers in Leighton Buzzard, these areas had been included in the Council's own Bill already referred to. He did not believe that the ratepayers in Leighton Buzzard would agree to the Council purchasing the Company's undertaking; and the outside parishes were distinctly against any such course.

Mr. BALFOUR BROWNE, in cross-examination, said that the clause with regard to paying back-dividends out of the reserve fund was absolutely unique in the case of any company applying for the sliding-scale. Witness, however, suggested that perhaps this was due to the fact that in most previous cases companies had not a reserve fund with which to pay off back-dividends. Counsel then dealt with the large amount of capital still unexpended, which witness agreed would carry the Company on for a little while at the present rate of progress. There was, however, considerable development going on all round; and the amounts asked for in the Bill were necessary to carry on the undertaking for the next ten years or so. It was also agreed by witness that there was sufficient surplus capacity at the works to supply the surrounding districts for a short while. On the question of the allowance for repairs and maintenance, which was an average of 10·947d. per 1000 cubic feet from 1904 to 1913, it was suggested by Counsel that this had been instrumental in keeping the price to the consumers higher than it should have been, having regard to the fact that the average for municipalities throughout the country was only 5¼d. Another point dealt with was that the calorific value test in the Bill, of 540 B.Th.U., only represented 14-candle power; whereas the Company at present were supplying 15-candle power gas. It was difficult to see why this question was raised, in view of the agreement between the parties to abide by the decision in this matter on the Gas Light and Coke Company's Bill. It was also put to witness that a "sterilization" clause—*i.e.*, to the effect that nothing should be done by the Company which would enhance its value between the present time and the time of the Council purchasing—would hurt the undertaking if, as witness suggested, the ratepayers would not give their approval to a purchase Bill; but this was not agreed to.

In re-examination, witness said that £1100 had already been paid out of reserve in back-dividends, and the amount outstanding was about £1500.

Mr. *G. Walton* spoke as to the general satisfaction of the town with the manner in which the Gas Company had carried out their obligations to the consumers. He expressed the opinion that the Council should not be allowed to take over the gas-works, in view of the fact that they had mismanaged the sewage-works, which had become a legal nuisance. Further, the water supply had been unsatisfactory; and there was considerable expenditure in prospect upon both these undertakings.

Mr. *J. T. Tarver*, Private Secretary to Mr. Leopold de Rothschild, spoke as to the need for a gas supply in Wing.

Mr. *C. E. Edmund*, Lord Rosebery's Steward on the Mentmore Estate, also supported the scheme.

Dr. *Johnstone Harris*, the Chairman of the Linslade Urban District Council, said that that body had passed a resolution strongly objecting to the gas supply being placed in the hands of the Leighton Buzzard Urban District Council, and pledging the Linslade Council to oppose such a transfer in every way.

Mr. *Charles Richardson* and Mr. *A. W. Merry* described the Gas Company's stock as the premier security in the district.

Mr. *H. G. Ruggles*, the Manager of the Gas Company, said that the proposed extensions of plant had been estimated as follows: Plant and works, £8161; mains, £8003; services, cookers, meters, and slot fittings, £4875; relief gasholders (if the extension outside the present area were granted), £4658; parliamentary costs, £2500.

In cross-examination, witness agreed that the plant at the works had a small surplus capacity practically in every department.

Friday, March 27.

On the resumption of the proceedings this morning,

Mr. *William Cash* gave details of the finances of the Company outlined in the opening speech. In this case, the sliding-scale would mean an advantage to the consumer of five compared with one to the shareholder for every penny reduction in the price of gas. The undertaking was now in a very strong financial position; the output of gas having increased from 36 million cubic feet in 1904 to nearly 56 million cubic feet in 1913. There had been a very large increase in the number of prepayment meters installed.

Mr. BALFOUR BROWNE cross-examined as to the policy of charging meters and stoves to revenue instead of capital. Witness replied that, on the other hand, depreciation should have been charged in order to write-off the amount in ten years. The policy of the Company inured to the benefit of the undertaking as a whole. Everybody in the gas industry was agreed as to the necessity for keeping down the capital account. Counsel's point was that the consumers in the past had suffered; whereas witness held that the policy of the Company was for the benefit of the consumer in the future and of the undertaking as a whole. The usual practice as to back-dividends was that they automatically disappeared when the sliding-scale was applied. But the Company could to-day pay the back-dividends; and it was for this reason that the Committee were being asked to sanction it being done, as fair to present shareholders. Witness agreed that the clause was unusual; but it was the common thing for companies to pay off the back-dividends before they came to Parliament for the sliding-scale to be applied. On the question of purchase, Counsel contended that the Company could only claim on the divisible profits as a maximum-price company. Under the sliding-scale, however, the claim would be on the maintainable profits; and the result would be a considerable increase in the value of the undertaking. Witness said this was upon a certain hypothesis—viz., a reduction in the price below 2s. 10d. At the present time the Company were admirably managed, and were supplying gas at a low figure. He agreed that a well-managed concern with surplus works could always expect to get a better price for their undertaking. This raised the point as to whether it would be any advantage to sell.

In re-examination, witness said that whether the value of the undertaking was enhanced or not by the proposals in the Bill, the Council

would only pay its actual value, and not a fictitious one. The position as to new meters and stoves was that instead of charging them to capital and writing-off in a short number of years by way of depreciation, the Company had charged the whole amount to revenue at the start.

Mr. *Henry Woodall*, whose firm has acted for the Company as Consulting Engineers for many years, said the position now was that it was essential to have further powers both as to area and capital. There had been requests from Wing for a supply of gas; and there might be a demand from the other districts. The Company were the only authority who could supply in this area; and he could not see any objection, now that they were before Parliament, to the additional area being granted. The total capital expenditure to the end of 1913 was £25,535, which gave a capital expenditure of £458 per million. In the past, there had been an average increase of 3·56 per cent. compound; but for the future he had assumed 4 per cent.—the small extra amount being due to the added area. The new capital was £28,192. In fifteen years he assumed that the Company would need to supply 44½ million cubic feet extra; and £750 per million being taken as the right allowance for capital expenditure, a sum of £33,375 would be required. Allowing, however, for the present surplus capacity of the works, he had deducted £3501; leaving £29,874 as the amount of capital required during the next fifteen years, or £2000 more than was asked for under the Bill. The price charged in Leighton Buzzard was the lowest in the neighbourhood, as also was the standard price. In many cases, the prices in both instances were about 1s. higher than Leighton Buzzard; and here the Council had a purchase clause which the ratepayers recently refused to sanction. In the case of Leighton Buzzard, some 35 per cent. of the total gas sold was outside the urban district. In the event of purchase of the undertaking by the District Council, the Linslade Council would have the right to purchase. But in their case there would be no gas-works. This was an instance of the difficulties which would occur if the purchase question was gone into.

In cross-examination, witness agreed that the Company could not oppose a purchase Bill by the Council. He did not see that a "sterilization" clause would do the Company any particular harm; but they should not be prevented from developing their undertaking in view of the fact that the Council had had the right to promote a purchase Bill for over twenty years. In further questions, Counsel suggested that the present district was more or less saturated; but witness said he had never found this anywhere, having regard to the increasing uses of gas. He quite agreed that there was enough spare plant to carry the undertaking on for a few years, although there was a deficit in the condenser plant. He placed the following values upon the main items of the surplus plant: Purifiers, £1179; gasholders, £1134; carbonizing plant, £309. It would, however, be unwise not to take the present opportunity, when the Company were before Parliament for additional area, to ask for new capital powers, which would be required in a few years. Purchase by the Council would break up the undertaking into a number of small ones. There would also be the anomalous position that the Leighton Buzzard Council would have on their hands a plant admittedly too large for the whole of the Company's area; while Linslade would only have mains. There would also be the question of severance, which would have to be settled. Again, the Wing Council were anxious to get a supply. But under a purchase by the Council, it would probably be the summer of 1916 before they got it.

This closed the case for the Bill.

Evidence was called in support of the Council's petition.

Mr. *George Payne*, the Chairman of the Leighton Buzzard Urban District Council, said the reason why the purchase clause in the Act of 1891 had not been put into operation was that the Council had not understood its real purport until the present year. It was now fully understood, and the ratepayers were practically solidly in favour of the purchase. He was convinced that the Council could manage the undertaking more economically than did the Company.

Mr. HONORATUS LLOYD cross-examined witness, who agreed that the suggestion as to purchase came from the Parliamentary Agent to the Council. He also made a few complaints as to the management of the Company. Counsel was going into some details in this connection when

The CHAIRMAN said the Committee were satisfied that the Company was well managed.

Mr. *F. G. Woodman*, a member of the Council, agreed with the previous witness's evidence that the majority of people in Leighton were desirous of the Council taking over the gas undertaking. There was a strong feeling that the price of gas should be reduced and meter-rents abolished. For the street lighting, although the price to ordinary consumers had been reduced by 25 per cent. since 1896, the Council were still paying the price they paid in 1896. A motion of his in the Council that the price should be reduced was defeated by one vote—the Chairman of the Company and a shareholder voting. The Directors had power to vote under their Act of Parliament; and he believed this was a power peculiar to the Leighton Buzzard Company. If the price for street lighting had been reduced in proportion to the private supply, the saving to ratepayers since 1896 would have been £994.

Mr. HONORATUS LLOYD cross-examined to the effect that the Council's management of the water and sewage undertakings was by no means satisfactory; but witness did not agree. Counsel, however, referred to several details which he contended showed this to be the case. As to public lighting, it was put to witness that the Council were, on the other hand, given the advantage of the lowest rate for power supply—viz., 2s. per 1000 cubic feet for all supply for power purposes—instead of being on the scale of paying according to quantity. This counterbalanced the price charged for the public lighting. Witness said that the Council did not desire to make a profit on the undertaking, and would be content with a clause in the Bill stating that, in the event of purchase, the Council should not make a profit.

Mr. *G. Chapman*, a member of the Urban District Council, supported the evidence of the other members of that body.

Mr. *E. H. Stevenson*, the Consulting Engineer to the Council, said that the likely supply in the proposed additional area could be met from the existing works. He did not disagree with the capital consolidation clauses; but he held that the new capital asked for was excessive. He had come to the conclusion that the present area was saturated, and there would be a decrease in the rate of progress in the future, unless considerably more population came into the district. There was absolutely no necessity for the Company to have any new capital powers at all, as the existing works were ample to meet the requirements at the end of 15 years, taking the same rate of increase as during the past five years. The capital powers asked for would carry the Company on for 52 years in their present area, taking the rate of increase during the past five years. This was the first time a proposal to pay back-dividends out of reserve fund had been made. It was the idea of the sliding-scale that the back-dividends should be given up. In the event of purchase, the reserve fund would go to the purchasers; but in that case, a claim would be put in for the back-dividends. He did not object to the back-dividends being paid if the Company remained a maximum-price concern; but this should not be allowed if they were given the advantages of the sliding-scale. In his opinion, the standard price in this case should be 2s. 6d., which would leave a margin after paying present dividends. The figure of 2s. 10d. was too high having regard to the fact that the total cost, as he had calculated it, including dividends, was 27·14d. per 1000 cubic feet. Looking at all the facts, he saw no necessity for the Bill at all.

In cross-examination, witness said an allowance of 6d. should be sufficient for repairs, renewals, maintenance, and depreciation—the latter item representing 1d. He would not agree that a company had to allow more than local authorities. It was, he contended, becoming the common practice to allow 6d. in arbitrations. Counsel suggested that 2s. 6d. was the lowest standard price witness had ever proposed; but he was referred to York, where 2s. 2d. was asked and 2s. 3d. was obtained. The reason here, said witness, was the small amount of capital which had been raised—thus depriving the consumers of reductions in price in the past. Counsel remarked that the actual price at York was 2s. 2d.; and the actual price was being asked by the promoters in this case. Finally, witness urged that nothing should be done in the Bill which would enhance the value of the undertaking.

Mr. BALFOUR BROWNE, addressing the Committee, said he made no complaint against the management of the Company; but he did complain that they were attempting to increase the value of their undertaking by the Bill. The effect of the Bill was that the Company were opposing the preamble of the Bill which the Council would bring forward, and which they undertook in 1891 not to oppose. Therefore he asked the Committee to see that the works which the Council would eventually purchase should be the works as they stood to-day, and not works with the inflated value which would be put upon them by the provisions of this Bill. If the Bill was to proceed, he did object to the conversion of capital clauses. But he maintained that the preamble had not been proved. If the Committee did pass the Bill, a very great hardship would be done to the ratepayers if a sterilization clause was not inserted. So far as the Wing area was concerned, he would pledge the Council not to oppose an application to the Board of Trade for an extension to this area, if the Bill went forward with a sterilization clause in the following terms:

> If the Leighton Buzzard Urban District Council shall introduce a Bill into Parliament in the next session for an Act to empower them to purchase the gas undertaking, and such Bill shall become law, the value of the gas undertaking shall not be enhanced or depreciated by the passing of this Act, or by anything herein contained, and the Company shall not issue any capital under the powers of this Act before November 30, 1914; and if the said Council shall give notice to introduce and *bona fide* promote such Bill, then the Company shall not issue any capital, but shall borrow such money as may be necessary to carry on the undertaking until the same shall be transferred to the said Council.

Mr. HONORATUS LLOYD said he represented a statutory concern against which Mr. Balfour Browne had said he could not complain; and unless the Council had had the clause in the Act of 1891, they could not have asked the Committee to consider the question of purchase. Furthermore, the section of the Act of 1891 did not authorize the Council to purchase, but only to come to Parliament with a Bill to purchase. Mr. Balfour Browne was suggesting something almost unparalleled in parliamentary history, because he was saying that a local authority which, by its own evidence, had no complaint to make against the gas company, should be authorized to tie the hands of that company, while the Council made up its mind whether it would or would not apply to Parliament to purchase. This power had existed for 23 years; but it had never been discussed by the Council. Not until the Parliamentary Agent brought it to the notice of the members did they think it worth while to take the question up at all seriously. This was simply a Westminster equipment—it was a tool used by a Parliamentary Agent with a view to beating the Company when he could find no other tool to beat them with. If ever there was a case in which purchase powers ought not to be exercised, and in which nobody desired purchase, this was it. The way the Company was being treated by the Council was not fair. The Company had exercised their parliamentary duties to the satisfaction of everybody, and should be allowed to expand their operations in the way proposed in the Bill.

After a short deliberation,

The CHAIRMAN announced that the Committee were of the opinion that the Bill should proceed.

Clauses were then adjusted; and the Bill was ordered to be reported for third reading. The point as to the provision of dynamos in clause 33, referred to in Mr. Honoratus Lloyd's opening speech, will be dealt with by the authorities of the House at a later stage. The other clauses remain unaltered.

The report by the Board of Trade on their proceedings and business under the Weights and Measures Acts during 1913 contains a list of gas-measuring standards which were verified or re-verified by them, or locally compared. It is also stated that 898,089 meters were tested, under the Sale of Gas Act, during the twelve months 1912-13.

SOUTHEND GAS BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, March 24.

(*Before Mr.* MOUNT, *Chairman, Mr.* PRATT, *Mr.* JOHN WOOD, *and Mr.* F. W. S. M'LAREN.)

This Bill is to authorize the Southend Gas Company to extend the limits of their area of supply, to acquire by agreement the Leigh Gas-Works of the Southend Corporation, to raise additional capital, and to use further lands for gas purposes.

Mr. G. J. TALBOT, K.C., and Mr. TYLDESLEY JONES appeared for the promoters. The Southend Corporation, who opposed, were represented by Mr. VESEY KNOX, K.C., and Mr. BEVERIDGE; while the only other petitioner, Mr. J. T. Wood, appeared in person. Originally there were five petitioners; the remaining three being the Port of London Authority, the Essex County Council, and the London Association of Accountants. The two first-named have been adjusted; while the latter, who have been unsuccessful in a number of Bills this session, as reported in our columns, did not appear upon their petition.

Mr. TALBOT, in opening, said the Southend Gas Company was incorporated in 1877 as a maximum-price company, with a maximum dividend of 7 per cent. and a maximum price of 6s.; the candle power being 14. In 1892, the sliding-scale was applied to the Company, with a standard price of 4s. 6d. In 1898, the capital was consolidated and converted; the standard dividend being fixed at 5 per cent., and the standard price reduced to 4s. 3d.—the slide being 2s. 6d. for every penny up or down in the price of gas. In 1904, the Company came again to Parliament for further capital; and the standard price was reduced to 4s. They were at present selling gas at 3s. 4d., which allowed of a dividend of 6⅜ per cent. being paid on all the capital except that authorized in 1904, on which 6 per cent. could have been paid. As a matter of fact, the actual dividends paid had been 5¼ per cent. and 5½ per cent. respectively. The paid-up share capital of the Company was £315,602. A sum of £20,446 had been received by way of premiums; making a total of £336,048. The unissued ordinary shares amounted to £23,243; while £24,100 of loan capital remained unissued. There was over-spent on capital account £6345; leaving a net unissued capital of £40,698. Rather more than one-half of this amount was represented by what might be termed a suspense account in respect of fittings, of which there were a great many in the district. This was actual capital expended, which had to be replaced out of revenue, and would have to be added to as the business increased. The district had increased in a phenomenal manner; the population having doubled itself between 1891 and 1901; and more than doubled itself again between 1901 and 1911. Dealing with the petition of the Southend Corporation, Counsel explained that last year the district of Leigh was incorporated with the borough, and the gas-works of the Leigh Council vested in the Corporation, who were also the electrical undertakers there. The preliminary negotiations between the Leigh Council and the Southend Corporation included some provision for the removal of the Council's gas-works when they were taken over; and the general opinion was that the Southend Corporation intended to dispose of them in some way, so that they might be discontinued. This general feeling was strengthened by an agreement between the two authorities, under which the Corporation promised, if they disposed of the works, to apply the proceeds towards the carrying out of an improvement of the sea-front. As in this connection there was no other body than the Southend Gas Company who could purchase the works, clause 6 was inserted in the Bill authorizing the Southend Corporation to sell, by agreement, the Leigh Gas-Works to the Southend Company. To this, however, for some extraordinary reason, the Corporation objected, although it did not bind them in any way. In the petition as originally drafted, the Corporation also asked to become purchasers of the Company's undertaking; but he understood that this was not now to be made a great point of.

Mr. BEVERIDGE, for the Corporation, said the petition was drafted at rather short notice, and everything possible was included in it in order to preserve their rights. This question had since been considered, and it was not proposed to press it.

Mr. TALBOT then dealt with the proposed extended area of supply, which included a part of the parish of Eastwood, Great Wakering, and a number of neighbouring parishes. Great development was going on in these areas; and the Company wished to be in the position to give a supply when the demand came, as it undoubtedly would. There was opposition to this, however—first on the ground that they would be unremunerative areas and the supply might be given at a loss, or, in the alternative, the Council could give a supply in the Eastwood district more cheaply than the Company if it were desired. As a matter of fact the Corporation could not supply all the needs of Leigh from their own gas-works, and had a contract with the Southend Company to take a minimum of 750,000 cubic feet per annum in bulk, at 2s. 9d. per 1000 cubic feet. It had been agreed between the parties to allow the calorific value test to stand over, as in other Bills, pending the general settlement. The other main point between the parties was the question of new capital; the amount asked being £225,000, *plus* one-third borrowing powers, which it was alleged was excessive. There was also a question of a testing-station, which was a clause matter. Another proposal was to use certain land adjoining the existing gas lands, and already belonging to the Gas Company, for the purpose of gas manufacture. To this, Mr. J. T. Wood and his wife, who had a house within the 300 yards limit, objected, on the ground that the value of their property would be prejudicially affected. Unless the Company could do as was now suggested, it would be necessary to go to the expense of removing the works altogether to another site, which appeared to be the suggestion.

Mr. *C. F. Woosnam*, the Chairman of the Southend Gas Company, confirmed the statement made by Counsel in opening.

Mr. BEVERIDGE, cross-examining, put it that the price of gas in Southend was extremely high, and wanted to know why in Margate and Ramsgate the charge should be 2s. 4d. and 2s. 6d. respectively, against 3s 4d., notwithstanding that Southend had all the advantages of sea-borne coal which the other two towns had. Witness said the reason was that Southend had developed at a rate beyond all expectations, and the capital expenditure had been so heavy that the price was necessarily comparatively high. It was also pointed out to the Committee by Counsel that the Company now wanted to charge this high rate to another portion of the borough, which the Corporation maintained they could supply more cheaply. In Southend there had only been a reduction of 2d. in eight years. Witness corrected this to 4d. in ten years. Comment was next made upon the high capital expenditure per million—viz., £1035—and also upon the large amount put to repairs and maintenance. Witness said this was 15d.; while Counsel contended it was 17d. Witness urged that no well-conducted company, having such a large proportion of slot meters as this, could do with a less allowance. There were 12,000 slot meters out of 17,000 consumers. In regard to the proposed purchase of the Leigh Gas-Works by agreement, Counsel said the Corporation had no intention of selling, and suggested that the Company should withdraw the clause.

After the luncheon interval,

Mr. TALBOT said he had taken the views of his clients on this matter; and while regarding the objection of the Corporation to this clause as absurd, as it could do them no possible harm, he was not disposed to press it.

In the course of further evidence,

Witness said a new gasholder was required, as well as extensions to the retort-house, purifiers, &c. The new capital powers included something for the purchase of the Leigh works.

Mr. TALBOT said there must be some reduction in the capital, having regard to the position now with reference to clause 6. He asked for a reduction of £25,000, but wished it to be clearly understood that this must not be taken as in any way representing the sum which the Company thought should be paid for the Leigh works. This would reduce the new capital powers to £200,000.

After a few questions by Mr. WOOD, as to the undesirability of extending a gas-works in the populated portion of a health resort,

Evidence was called as to the need for a gas supply in Great Wakering. It was pointed out that several large plots of land were being marked out for building sites, and that, apart from these, the existing houses and shops desired gas.

Mr. *Henry Woodall* next gave evidence. He calculated that the future capital expenditure of the Company would be at the rate of £750 per million cubic feet. The heavy capital expenditure in the past had been in large measure due to the high average cost of the prepayment installations, which was £11, instead of about £5, which was the usual figure. This was brought about by the fact that so many of the prepayment consumers let rooms, and consequently had more fittings and bigger cookers than in other towns. As a matter of fact, large sums would have to be written-off the capital expenditure on prepayment consumers, as he did not think the Company had done enough in this direction in the past. If they had, the capital expenditure would have been smaller. He had allowed 8 per cent. compound increase in the output for the next ten years. On this basis, the capital expenditure required would be £307,000.

Mr. VESEY KNOX cross-examined at some length for the Southend Corporation, first stating that he raised no question as to the extension of the works. A discussion followed on the amount set aside for repairs and maintenance, which it was alleged was excessive.

The CHAIRMAN: I do not understand what object you are trying to gain by proving excessive maintenance and repairs.

Mr. VESEY KNOX said the consumers were paying a very high price for gas; and if the policy of the Company was to be to continue to charge capital sums to revenue, then they could not require the large amount of capital asked for in the Bill.

The CHAIRMAN: I do not see the good of going into what has been done in the past with regard to maintenance.

Mr. VESEY KNOX said it was a mystery to the engineer who was advising the Corporation how the Company managed to make their costs so high; and he was trying to find out how they were so high. If it was, as suggested, due to mismanagement, it should be set right.

It was then put to witness that a clause similar to that in the Preston Gas Act of 1911 should be inserted—viz., that obsolete capital should be written-off out of dividends and not out of revenue; a certain amount each year being allocated to a capital redemption fund. Witness said that, in effect, the Directors in this case, by putting aside a large amount for repairs and maintenance, were doing this. At the present time there was an amount of £11,000 standing to the credit of the reserve, which might have been distributed in dividends. Counsel, however, would not have it that this was the same thing as he had suggested. If capital was to be written-off—and there were cases where it had to be done specially, such as the Gas Light and Coke Company and the Brighton Company—then it should be written-off openly, and not as an overcharge for repairs and maintenance. Witness said he was inclined to agree. Finally, reference was made to a testing-station, which Counsel offered to provide away from the works, where the Corporation could test the quality of the gas. This was agreed to on principle, so long as there was not more than one station. Counsel suggested one at the Town Hall.

Mr. WOOD, in the course of his cross-examination, suggested that the smell from the gas-works was so bad as to cause severe headaches and sickness among those living near. Witness expressed great surprise at hearing this.

Re-examined, witness said that a testing-station away from the works should only be agreed to on the understanding that the Company were officially represented at any test made. In the case of the Brighton Company and their obsolete capital expenditure, they were allowed to write this off out of revenue—a practice at variance with the principle laid down by Counsel, that the consumer should not pay.

The CHAIRMAN suggested that the parties should endeavour to agree as to the testing-place, as there did not seem much between them.

Wednesday, March 25.

In answer to the Chairman this morning, Mr. VESEY KNOX said he thought the question of the testing-station would be agreed.

Evidence was then called for the Southend Corporation.

Mr. *E. H. Stevenson* said he was familiar with the district, having acted for the old Southend Urban District Council and the Leigh and Shoebury Councils. Dealing with the proposed additional area of supply, he said that, except for Great Wakering, there was no district on the east of the town where a supply could be required.

Mr. TALBOT, for the Company, said that, as things stood, this was not disputed.

Witness added that in the borough of Southend itself there was a considerable area in which the Gas Company had not laid mains. He anticipated that eventually the borough would be extended to include Shoebury, where there was already a municipal gas-works, and it would be the most natural thing to supply Wakering from the Shoebury works. At present, however, he did not believe there would be anything which could be called a demand in Great Wakering, and certainly not sufficient to justify an extension of the mains. There was also the possibility that the Gas Company, in desiring to extend outside the borough, were aiming at putting difficulties in the way of the Corporation acquiring the Company's undertaking, should they wish to do so in the future. As to Eastwood, part of which was now included in the borough, the Corporation were authorized to supply under section 161 of the Public Health Act; and from an engineering point of view a supply could be given from the Leigh works. The mains were very close up, and a supply could most conveniently be given from the Leigh works. To give the Company powers would be to take away from the Corporation a parliamentary right to supply under the Public Health Act where there is no statutory gas authority supplying. He did not know of a case in which this was done where the local authority desired to supply. In the present case, part of Eastwood had only recently been added to the borough. He would advise the Corporation to at once extend their mains there, as would be necessary for public lighting; and then, of course, the ordinary consumers could be supplied. There was still a portion of Eastwood outside the borough which should also be supplied; and whoever obtained the district inside the borough should have the district outside. To do this, the Corporation would have to promote a Provisional Order or a Bill; but this would have to be done very shortly in respect of the Leigh undertaking, which was developing at a very rapid rate. The existing capital of the Company was extraordinarily high. The general rule was that, as an undertaking increased in size, the capital per million diminished.

The CHAIRMAN: I think there is no dispute about the capital being high.

Witness said a great deal of the present capital was obsolete—probably as much as £130,000. The Company in 1912 spent 17·80d. per 1000 cubic feet on maintenance and repairs. This represented £20,000, a large portion of which could not have been spent on repairs and maintenance. But there was nothing in the balance-sheet to show how much had actually been spent on repairs and maintenance and how much on capital. As to the new capital, if the original £225,000 included a sum for the purchase of the Leigh undertaking, as was suggested, then the reduction of £25,000 since the withdrawal of clause 6 was not sufficient. It should be reduced by at least £40,000 share capital and £15,000 loan capital. Even with the reduced new capital, the Company would have over £300,000 capital powers, which was, in his opinion, too high a figure, having regard to the circumstances. Whatever amount of obsolete capital was to be written-off out of revenue, by so much should the new capital be reduced. Gas in this district ought to be very much cheaper than it was. Reference was made to the Margate undertaking in this connection, where the price was 2s. 4d., compared with 3s. 4d. Even this was not the true comparison, because the Company in Southend charged 4s. to the slot consumers, and there was a difference of about 1s. 5d. between the two undertakings in respect of slot consumers. The fairest way to deal with the obsolete capital would be to insert the Preston clause, with an amendment in favour of the Southend Company. The Preston clause was too drastic for Southend. He suggested that instead of the provision as to obsolete capital being made after the payment of the standard dividend, it should be made after the payment of the dividend paid by the Company last year, which was 5½ per cent., although the Company could have divided 6 per cent. If the Preston clause was inserted without amendment, anything over 5 per cent. would have to go to reducing obsolete capital, which he considered would not be fair to the people who had invested their money on the basis of last year's dividend. He suggested that the Company should not be allowed to increase their dividends beyond 5½ per cent. until provision had been made for the obsolete capital. Upon this basis, £150,000 share capital would be ample for the Company's future requirements, with, of course, one-third loan capital. This would carry the Company on for ten years.

Mr. TYLDESLEY JONES cross-examined. A long argument took place as to the renewal of plant out of revenue. Witness maintained that under the Gas-Works Clauses Act it was incumbent upon a gas company to do this; but Counsel said that lawyers did not take this view. Although this had been done to some extent by the Company, it was in fact not a legal thing to do. As to the insertion of the modified Preston clause, provided the right was retained to carry forward an amount equal to a year's dividend, Counsel said he thought there was not much between the parties.

A consultation took place on the matter.

Mr. TYLDESLEY JONES said he had been trying to arrive at a settlement; but there was one difficulty. Under the Preston clause, the whole of the capital redemption fell upon the shareholder. Redemption, however, was partly for the benefit of the consumer also, because the price of gas was thereby enabled to be reduced. There were precedents where a portion also fell upon the consumer; and in this case the Company were quite prepared to apply the divisible profits over and above the dividend paid last year, provided they were also allowed to apply some amount each year out of revenue for the same purpose.

Witness said he did not agree with this, because in the past the Company had been paying the shareholders more than they should have done.

Mr. TYLDESLEY JONES pointed out that, if the dividends had been reduced, the price of gas would not have been so low as it is; and therefore the consumer also had benefited in the past.

Mr. VESEY KNOX, for the Corporation, said that the sum of £30,000 was regarded by the promoters as the amount of obsolete capital; and if the Company would agree to meeting this out of capital, a further sum might be met out of revenue. Upon this, he did not think there should be much difficulty in agreeing.

Witness suggested that a further sum of £30,000 should be met out of revenue, making £60,000 in all, or about half what he himself estimated the obsolete capital to be.

Mr. TYLDESLEY JONES said that this revenue item should not be compulsory, but permissive as in the Brighton case, because it might not be possible to do it in the case of a bad time in the coal trade, for instance.

Mr. VESEY KNOX agreed to this.

The CHAIRMAN: The Committee strongly feel you should be able to agree a clause on these lines.

This left only the question of the extended area between the parties on the preamble; the Corporation agreeing to raise no point on the capital powers if this concession as to obsolete capital was agreed.

Mr. TYLDESLEY JONES, dealing with the extended area, pointed out that, under the Public Health Act, a local authority must have a Provisional Order before a supply of gas could be given; but this was disagreed with. There was a difference of legal opinion on the point. In order to arrive at an agreement, he suggested dividing the area of Eastwood between the Company and the Corporation; but to this witness would not agree. The portion of Eastwood outside the borough would eventually come into the borough; and he would not agree to giving this up to the Company. Further questions were put, suggesting that the Leigh Gas-Works were not good or capable of much extension; but witness said they were a perfectly good works, and that they were supplying satisfactorily—indeed, the Corporation could have supplied at 9d. per 1000 cubic feet less than the Company in 1913.

The CHAIRMAN asked if the division of the Eastwood area suggested by Mr. Jones was acceptable to the Corporation.

Mr. VESEY KNOX said he could not give up the right to supply which he contended he had under the Public Health Act. The Corporation would be giving something and getting nothing in return.

The CHAIRMAN: You run the risk of losing it all.

Mr. VESEY KNOX said the Corporation had their gas-works, and could lay mains in Eastwood to-morrow. He was prepared to leave the Company the few houses which they were supplying, although this was being done without powers.

Witness, in re-examination, said that, if the Leigh works were properly managed, they could deal with the Eastwood supply. Extensions of the plant were under consideration, although perhaps the question of the removal of the works to a larger site would eventually have to be considered.

Mr. *Joseph Francis*, the Mayor of Southend, said the Corporation was willing to supply in Eastwood; large developments being anticipated there.

In cross-examination, witness said the Corporation had passed no resolution with regard to this matter.

Mr. *E. J. Elford*, the Borough Engineer and Surveyor at Southend, spoke as to the districts where the gas-mains had not been laid. In some streets, the Company had been asked to lay mains, but had not done so. The result was that some oil-lamps had had to be erected for street lighting.

Mr. TYLDESLEY JONES, in cross-examination, said that the roads in question had not been taken over by the Corporation. They were deep with mud, and there were very few houses. Witness, however, said he thought this was an exaggerated description.

Mr. VESEY KNOX then addressed the Committee as to the extensions of area. There had been no case made out for the extension to the Great Wakering district. The Company had, indeed, found it difficult to keep pace with the demand in the town itself, and they should first lay mains throughout this present area before being allowed to extend into rural districts further out. There was no immediate intention of going there; and the shareholders would not be hurt in the slightest degree if the Committee refused the proposal. No evidence had been given of the probable demand; and it would not be worth the Company's while to lay mains there. The only authority who could profitably supply were the Shoebury Council. With regard to the extension in the Eastwood area, he contended that under section 161 of the Public Health Act the Corporation had the right to supply—in fact, he was surprised to hear the construction put upon the words by Mr. Tyldesley Jones for the Company. This section clearly allowed the local authority to "undertake" to supply gas in the area; and he could not understand what construction was being put upon the word "undertake" when it was suggested that the local authority must apply for special powers. He failed to see what else it meant than that the local authority should commence an undertaking for the supply of gas. The position in this case was strengthened by the fact that the Corporation had their gas-works and were actually supplying. Therefore it would be a very strong thing to take away the powers which had only been in the possession of the Corporation for four months—*i.e.*, since the boundaries of Southend were extended.

The CHAIRMAN remarked that, if this reading of the law was accurate, it was a little surprising that the Local Government Board had not called attention to the fact in their report.

Mr. TALBOT said he differed entirely from Mr. Vesey Knox's view in this matter.

Mr. VESEY KNOX said that the borough boundaries were extended by Act of Parliament and not Provisional Order; and it was just possible that the Local Government Board were not fully aware of the extent to which the area had been extended. Perhaps the Committee would like to consult with the Local Government Board as to their view of this section of the Public Health Act. He would carry it one step further, however, and say that, even if the Committee took the view that the point was a doubtful one, then preference should be given to the local authority, especially as that body had existing works and were willing to give a supply.

Mr. WOOD then addressed the Committee on behalf of himself and a number of occupiers within the 300 yards limit of the gas-works, who complained of nuisance from them. He was placed in a difficulty,

he said, because influential members of the Council were Directors or shareholders in the Company; and people whom he would have liked to call as witnesses were afraid to come for fear of injuring their position in Southend. He had, however, signatures of every owner within the 300 yards limit protesting against the proposed extension of the gas-works. His own house would scarcely be worth living in if the additional plant was erected on the site. Already his wife and himself had suffered badly in health from the smell, smoke, and dust coming from the works. Although he admitted that he had purchased his house twelve months ago, with the full knowledge that the works existed, he strongly protested against any increase in the nuisance from which he now suffered.

Evidence to this effect was called.

The CHAIRMAN said Mr. Talbot need not trouble to reply with regard to the extension to Great Wakering; but the Committee would like to hear an argument as to the legal position as regards Eastwood, so far as this was within the borough boundary.

Mr. TALBOT said that his view of the reading of section 161 of the Public Health Act was that the local authority must get a Provisional Order—except for public lighting purposes—before they could give a supply of gas. He suggested that a reasonable compromise would be to share the district of Eastwood between the Corporation and the Company.

The CHAIRMAN, in announcing the Committee's decision, said the preamble of the Bill would be proved subject to the area of Eastwood being divided between the Corporation and the Company by a line drawn from Brick House Farm to Blatches. The Great Wakering area would be given the Company; and the clause with regard to the capital redemption would go in—clause 6 coming out.

The Bill was then ordered to be reported for third reading.

The clause relating to obsolete capital provides that, after the Company have paid a dividend of 5½ per cent (which was the amount paid last year), a capital redemption fund shall be created, with the following proviso:

(1) As soon as the Company shall under this subsection have transferred to the funds sums amounting in the aggregate to £30,000, this subsection shall cease to operate and have effect;

(2) The Directors of the Company may, in addition, if they think fit, at any time and from time to time appropriate out of the revenue of the Company as part of the expenditure of the revenue account and transfer to the said fund any sums not exceeding in any one year the sum of £3000, and not exceeding in the aggregate the sum of £30,000.

STONE GAS AND ELECTRICITY BILL.

The Bill promoted by the Stone Gaslight and Coke Company was sent forward for third reading by the Unopposed Bills Committee of the House of Lords on Monday of last week.

Under the Bill the Company, which has been in existence since 1881, and was incorporated in 1908, is granted an extension of its area of supply, the sliding-scale is applied, and powers are given to supply electricity within the limits of the gas area. The Bill further provides for the change of the Company's name from the Stone Gaslight and Coke Company to the Stone Gas and Electricity Company; and additional capital to the extent of £6500 may be raised.

Originally the Bill was down to come before an Opposed Committee; but was subsequently referred to the Unopposed Committee. One of the points on which opposition was being offered was, we understand, with regard to the county roads and bridges of the Staffordshire County Council. A clause, however, has been agreed with regard to bridges only. In the event of the Council desiring to alter the position of any of the Company's mains on the bridges, a month's notice is to be given to the Company, and the alteration is to be carried out at the Council's expense.

Another interesting clause which has been agreed since the Bill was deposited is one giving the Stone Urban District Council purchase powers over the undertaking by giving six months' notice after the passing of the present Bill of its intention to introduce a purchase Bill in the session of 1916. The Company will not oppose, except on details.

Accident at the Saltley Gas-Works.—Falling eight or nine feet to the ground from a plank on which he was working at the Saltley works of the Birmingham Corporation Gas Department, a man named Poulson fractured his skull, and died almost immediately. He had been employed at the works for thirty-one years. At the inquest last Friday, evidence was given that on the previous Wednesday afternoon deceased was attending to the fires in the new battery of coke-ovens. He had to wheel the coke and ashes across a staging 33 inches wide and 75 feet long over a viaduct. The staging was only a temporary arrangement. There were no rails to the planks, which were in the nature of a scaffold; and the planks were not braced together. Before the accident there was a span of 13 ft. 10½ in.; but since then trestles had been placed under the planks to keep them from springing when the barrows passed over. A fellow-workman stated that Poulson was walking over the staging with an empty barrow behind him. He caught his foot on the leg of the barrow, and in trying to recover his balance and save the barrow at the same time he fell off the planks into the cavity below. The Jury returned a verdict of "Accidental death," but expressed the opinion that rails should have been placed along the staging, and that the planks should have been braced together. Mr. J. E. Harston, one of the Inspectors of Factories, who was in attendance, said he would not have considered the staging dangerous.

LEGAL INTELLIGENCE.

AN ELECTRICITY GENERATING NUISANCE CASE.

In the case of *Edwards v. Brixham Gas Company*, which was heard before Mr. Justice Neville last December, applicalion was made to Mr. Justice Astbury in the Chancery Division, on Friday, for a further suspension of the operation of the injunction granted against the Company.

The action, it may be remembered, was brought in respect of a nuisance by noise and vibration to the plaintiff's shop and cottage property adjacent to the gas-works; and in granting the injunction, Mr. Justice Neville suspended its operation for three months from Dec. 17 to enable the Company to abate the nuisance. From March 17 the suspension had been extended, by agreement.

Mr. GOVER, for the Company, now asked that it should be extended for a further three months.

Mr. PETERSON, K.C., for the plaintiff, did not object, provided the defendants paid rent from March 17 in respect of two cottages that have remained vacant owing to what had taken place, and undertook not to use as evidence the result of any experiments made in the cottages unless the plaintiff and his advisers were given an opportunity to be present.

Mr. GOVER accepted these terms.

His LORDSHIP thereupon suspended the operation of the injunction until June 17 next.

LIABILITY FOR REINSTATEMENT OF PAVEMENT.

Decisions against the Commercial Gas Company.

His Honour Judge Smyly, K.C., gave his considered judgment in the Bow County Court, last Tuesday, in the actions [reported in the "JOURNAL" last week, p. 846] having to do with the liability of gas companies in connection with the keeping in suitable condition of pavement after laying gas-mains. The two plaintiffs, Mrs. Ellen Brame and Clark Clark, both claimed £50 damages from the Commercial Gas Company. The evidence was taken in the case of Mrs. Brame; and it was then decided, as his Honour was reserving his decision, that if it was adverse to the Gas Company the damages in the case of Clark should be £30.

Judge SMYLY, in giving judgment, said he recognized the importance of the matter, both to gas companies and to borough councils; and that was why he had gone very carefully into it. The damages in the second case had been agreed, so he had not to trouble about them; the result following his decision in the first case. It appeared that on Aug. 5 the plaintiff left home with her husband, sister, and brother-in-law, in the evening, for the purpose of going to a theatre. When opposite No. 58, Canton Street, she fell, as she tripped over a paving-stone, which was raised about 1½ inches above the others. It was obvious that it was raised too high, that it was dangerous, and that whoever was damaged by falling over it was entitled to be compensated by somebody. The point was, by whom. He had assessed the damages in the case at £35. The question was as to who was liable—the Gas Company or the Borough Council. Prior to the Company pulling up the pavement, they received a notice from the Poplar Borough Council to the effect that they were about to repair Canton Street, along with some others, and asking defendants to do what repairs were necessary to their gas-mains, to save the work being done twice. Accordingly, the Company started relaying their mains in Canton Street on July 23, and finished on Aug. 1. The work was done in sections; and the particular section where the accident happened was commenced on July 26, and ended by the temporary laying of the pavement on the 28th. It appeared clear that under section 114 of the Metropolis Management Act, the Council had determined to relay the pavement after the repairs had been carried out by the Gas Company. The Company replaced the earth, after the repairs, and then temporarily put the paving stones on the top, but did not fix them with cement. They then at once sent a notice to the Borough Council, telling them that this section had been completed; and the Council immediately sent along to their District Surveyor to lay the stones permanently. Eventually, they laid a bed of mortar, and fixed the stones with mortar and cement. That the paving stones were liable to become uneven was clear by the evidence of two workmen in the employ of the defendants. A man named Adams swore that on Aug. 2 he examined the stones, and found them in good order; but a man named Reading found three of them wrong two days after. This was all that needed seeing to at that time; but on Aug. 5 and 6 Adams went again, and had to raise a dozen or more flags. It showed, if the examination was a good one, and the pavement was good as suggested on the 2nd, that it would go very rapidly. It was not hard to find a reason, as water would get down between the stones, and cause the earth to subside in places. Stones would be sure to get uneven, and go up on one side or the other from this cause. The Company had done their best or their duty, by sending the notice to the Council on the same day that they completed their work. Again, the Council immediately took action by sending notice to the District Surveyor. The defendants contended that they were relieved from liability by the notice; but it had to be borne in mind that Adams, as late as Aug. 6, raised the stones, and Reading did the same on the 4th, which was a bank holiday. He said he was sent specially to do it. As the Borough Council themselves said they would lay the paving stones, the question for answer was whether the Council or the Company were liable; the contention being that the Council must be liable for a reasonable time after the notice. He thought the two days after the notice would be reasonable for them to take over the work; but the question was,

Did they, as a fact, take it over? It was quite obvious the temporary pavement was dangerous; but he did not think he could find as an inference that, because it was dangerous on Aug. 5, it was also dangerous on July 28. It was clear Adams and Reading looked after the pavement; and he had come to the conclusion that the action of the servants of the defendants was negligence on the part of the Company, from which he could infer that defendants had an arrangement to look after the pavement until the Council were ready. They had to remember that, in reply to the plaintiff's claim, they answered that the Council had taken over the work, and that therefore they were not liable. There was nothing, either, to show that the Council did so as a matter of fact, until after the accidents. There was nothing in section 114 of the Metropolis Management Act to say that the Council were not the right authority to see to the permanent laying of the pavement; but his conclusion was that, as the Company opened the earth, they were liable until such time as it was taken over by the Council, for the permanent stones to be put down. If the work of looking after the pavement was undertaken by one or more of the defendants' servants, it was clear that they had it in mind to keep it in order—particularly in view of the fact that one of them was sent specially on a bank holiday to carry out repairs. He found for Mrs. Brame for £35 and for Clark for £30, with costs on scale B. It had been a difficult matter to determine; and he thought it most likely the defendants would wish to appeal. They could get a stay of execution by paying the amount of damages into Court.

Mr. CASSELS (for the Gas Company): We shall certainly appeal, as it is of such importance to gas companies.

Nuisance Caused by Gas-Engines.

In the Chancery Division of the Manx High Court, a settlement has been announced in an action brought by Mr. James M'Clure, a jeweller, of Strand Street, Douglas, against the Strand Cinema Company, Limited, who have erected a picture house next to his premises. The action was for an injunction to restrain the nuisance caused by the noise of the Company's gas-engines. By the terms of settlement, the Company are to take over the plaintiff's lease and pay him one year's profit, and also £150 to cover damages and costs. Medical evidence showed that the noise had reduced the plaintiff's wife to a very serious condition.

Jewellery Tarnished by Gas.

The Athy (co. Kildare) Gas Company appealed at the Kildare Assizes against £10 decrees given to Mr. E. Higginston and Mr. W. T. Duthie, two firms of jewellers at Athy in respect of jewellery which they alleged had been tarnished by sulphurous gas supplied for lighting purposes by the Company [*ante*, p. 374]. The plaintiffs gave evidence to the effect that their electro-plated goods turned black, and that this was due to the gas-fumes. Mr. Justice Gibson examined the specimens produced in Court, and said they were not any worse than jewellery to be seen in Dublin. His Lordship reduced the award to £5 in each case.

Belfast Gas Poisoning Fatality.

At the Belfast Assizes last week, before Mr. Justice Boyd and a Jury, Maggie, Elizabeth, Annie, and Thomas Galbraith, minors, by W. J. Galbraith, brought an action against the Corporation for damages in respect of the death of their father, William Galbraith, through gas poisoning, on the night of Dec. 19 last. Mr. T. W. Brown (the Counsel for the plaintiffs) said the action was listed for the apportionment by the Jury of £500 lodged in Court by the Corporation. He explained that on the night in question one of the gas-mains burst, and that, as a result, the children found their father dead in the kitchen in the morning. The Jury awarded £175 to Thomas Galbraith, and £130 to Annie, £115 to Elizabeth, and £80 to Maggie.

Elham Valley Water Company's Area.

In the Chancery Division last Tuesday, Mr. Justice Eve sanctioned the petition of the Elham Valley Water Company asking for confirmation of alterations of the Memorandum of Association with regard to the objects of the Company. It was explained that the Company carried on business in Kent, and had recently applied to the Board of Trade to be allowed to extend their supply to the parishes of Monks Horton, Sellindge, and Lympne. The Board of Trade were willing; but under the Articles of Association the Company were limited to certain other parishes. They had now taken the necessary steps to secure an extension of the objects.

A Prosecution Pending.

At the London Bankruptcy Court, on Friday, before Mr. Registrar Brougham, an application was set down for hearing for the discharge of Harry or Herman Maisner, described as Maisner and Co., No. 45b, Jewin Street, E.C., importer and exporter, against whom a receiving order was made on Oct. 13 last, on the petition of a creditor. Upon the debtor's name being called, Mr. W. P. Bowyer, who attended as Official Receiver, said his report upon the case was a very long one; and there were certain offences alleged in it against the debtor. As a matter of fact, an order had been obtained for the prosecution of the debtor which would come on for hearing in the Police Court shortly; and as he did not wish to prejudice the proceedings, he thought it would be better to adjourn the application until these proceedings had been disposed of. Mr. Raphael, who appeared on behalf of the debtor, said he could not resist the application for an adjournment. He hoped, however, in a certain event the debtor's discharge would be suspended from the date of the original hearing. The statement of affairs filed by the debtor disclosed liabilities to rank amounting to £9272; and proofs had been lodged against the estate amounting to £8178. The assets had realized £1196. The debtor was formerly Managing-Director of a Company formed to exploit patent gas-burners; and afterwards he was in business as an importer and exporter of incandescent mantles. Eventually the application was adjourned until May 27.

MISCELLANEOUS NEWS.

LEICESTER'S NEW VERTICALS.

Official Inauguration.

Miserable meteorological conditions were associated with the formal opening, on Monday last week, of the new vertical retorts and coke-handling plant of the Leicester Corporation—an illustrated description of which appeared in the "JOURNAL" for March 24, pp. 809-12. Those who responded to the invitation of the Chairman of the Gas Committee (Alderman T. Smith) had, however, much to interest them as a result of their visit to works contiguous to Belgrave Gate. Both there and at the subsequent proceedings at the Grand Hotel, where a large party was entertained to tea, there was abundant proof of the expectations entertained from the instalment of the Glover-West plant. Incidentally also the matter embodied in several speeches was significant of the profitable nature of municipal ownership; while Alderman Smith and a former Chairman of the Committee (Sir Edward Wood), who has been four times Mayor of the Borough, were responsible for the expression of opinion that the installation of modern-day appliances was not likely to be limited to the plant now completed.

At the works, the Mayor (Councillor J. Russell Freears) and other members of the Corporation were received by Alderman Smith and his colleagues; a tour of inspection being at once undertaken under the guidance of Mr. Hubert Pooley, Assoc.M.Inst.C.E., the Corporation Gas Engineer and Manager. There were also present representing the Contractors, Mr. John West, Mr. Fred. J. West, and Mr. Ernest West, who afforded much valuable information in regard to matters of detail. They were aided by Messrs. W. Lovell, the Assistant Gas Manager, G. B. Fiddes, the Assistant Engineer, W. Smith, Superintendent, and L. W. Smith, Assistant Superintendent at the Belgrave Gate Works, L. Cottrell, F. Rudge, and many others. The scope of the system was practically exemplified. The discomforts at the works, incidental to a pitiless downpour of rain, were atoned for later by the more pleasant conditions at Leicester's principal hotel, where Alderman Smith presided over a large company.

After the loyal toast,

The MAYOR proposed "Success to the Vertical Retort Installation," observing that nobody who had visited the works that day could fail to be impressed with the admirable character of the new appliances. It had been a gratification to learn, from the information afforded by Mr. Pooley and others, how great an improvement, as represented by the Glover-West plant, had been brought about in the process of gas manufacture. The enterprise of the Leicester Corporation in the matter formed one step in the never-ending task of bringing their equipment up to date; providing them with the very latest appliances with which to wrest from Nature every ounce of benefit she could give them at the least possible cost. The Chairman and his colleagues upon the Gas Committee merited their heartiest congratulations upon the results of their latest venture. It might be thought by some that Leicester ought to have had this installation some years ago; but it should be remembered that there was often, as in the present case, something to be gained by waiting. There was the advantage of being able possibly to benefit from the mistakes of others. The result of the delay in regard to this matter in Leicester's case was that they had now the satisfaction of knowing that their plant was thoroughly well equipped. They obtained from it more gas and coke, and of better quality, than under the old plan; while they also obtained better residuals—all this being effected with a saving of labour. He had nothing but the highest admiration for machinery such as that installed at their gas-works, which relieved men from conditions of work such as formerly prevailed—conditions which were so enervating and laborious as to have often rendered the workers prematurely old. In regard to the products accruing from the new process of manufacture, he had had the opportunity of using in his own business the first load of coke drawn from the new retorts, and he was highly pleased with the result upon the economical score—the coke being practically free from water.

Alderman T. SMITH, in responding, observed that the general public were scarcely alive to the revolution which had taken place in recent years in the application of science to methods for producing gas or to the universal use and adaptability of it for lighting, heating, cooking, and industrial, including motive, purposes. To-day no factory, household, office, or study was up-to-date without its gas-engine, its incandescent light, its gas cooking stove or its gas-fire for heating purposes. Within the next few years, there could be no doubt at all that the almost universal use of the gas-cooker and the gas-fire would be responsible for lessened coal bills, and would also contribute largely to a more healthy, less smoky, and less foggy atmosphere in our great industrial centres. As indicating the importance of the gas industry, he thought the following figures might be of interest: The capital invested in the gas industry in the United Kingdom amounted to close upon £140,000,000; the coal carbonized amounted to about 17 million tons per annum; the annual gas consumption being 200,000 million cubic feet. This was distributed to 7 million consumers, through 38,000 miles of main pipes. Coming to local facts and figures, he explained that the Leicester Gas Company was formed in 1831; the town being first lighted from the Belgrave Gate works during the winter of 1821-2. The undertaking was transferred to the Corporation as from July 1, 1878. The Belgrave works continued to supply the whole of the gas for the town until the Aylestone Road works were opened in 1879. The capital outlay of the old Company was represented in June, 1871, by a sum of £142,000, with a reserve and renewal fund of £18,569. The purchase price was £476,651; and the total capital outlay now amounted to £1,395,339. The capacity of the Belgrave works in 1879 was 3 million cubic feet per day. The population of the area was then 114,000; it was now 255,000. And the productive capacity of the works was 15 millions daily. The amount of coal carbonized in the earlier period referred to was 52,000 tons; whereas it was now 189,000 tons. The gas made in the respective periods under review was 518 millions and 2286 millions per annum. The number

of consumers in the earlier period was 19,000, and now 63,000; miles of main then 90, now 302; number of officials and employees at the time of the transfer 400, now 1200; wages per week at the transfer £200, now £1500; price of gas at the transfer 2s. 10d. per 1000 cubic feet, with meter-rents, now 2s. 4d., power 1s. 6d. and no meter-rents; number of cooking-stoves now fixed 54,000; gas-fire hire-purchase scheme commenced September, 1913, now fixed 3230; number of consumers at the transfer 19,000, now ordinary 23,975, prepayment (introduced in 1894) 39,094—total 63,069. So far back as September, 1909, the then Gas Engineer (the late Mr. Alfred Colson) reported to the Gas Committee upon improved carbonization methods, with special reference to modern practice and machinery, in use in the more important Continental cities. Early in 1911, the present Engineer (Mr. Pooley) again drew the attention of the Committee to the extensive changes which were gradually being made in the method of setting retorts for the manufacture of coal gas, both in this country and on the Continent. During that year the Vice-Chairman (Mr. George Hilton), the Engineer, and himself visited several gas-works on the Continent; and the conclusion at which they arrived was that the continuous vertical system was the best for such a town as Leicester. Subsequently a special Sub-Committee of the Gas Committee investigated the various examples of the continuous vertical systems at Luton, Bournemouth, Kensal Green, Manchester, Rochdale, and St. Helens, and one example of the intermittent system at Sunderland. The whole Committee afterwards visited some of the more important of these works; and the unanimous opinion of these deputations was that the continuous system provided the most humane method of producing coal gas, and at the same time resulted in very substantial savings in the cost of manufacture as compared with existing methods at Leicester. Competitive schemes were invited from the two leading firms who then erected continuous vertical plant in this country; the successful Contractors being West's Gas Improvement Company, Limited. Before placing the contract, the Gas Committee had tests made at the St. Helens Gas-Works by Dr. Harold G. Colman, on coal regularly used in the Leicester locality; some 300 tons being sent there for the purpose. The contract was given upon the guarantee that the results obtained should be equal to the tests made at St. Helens. In this test, the gas produced was above the Leicester standard of 14 candles, and was of sufficient quantity per ton of coal used to ensure a very substantial monetary saving. As a result of this satisfactory test, the contract was placed with Messrs. West, and work was forthwith commenced. The work of the foundations was carried out by their Engineer and the Gas Department workmen; and in this part of the work it was satisfactory to say that there had been no accident to any of the employees engaged. After referring to the operations in connection with the working of the new plant, Alderman Smith went on to deal with the financial part of the scheme. The Gas Committee recommended the Council that, as the new system was displacing other plant of older type, the cost should be borne out of the accumulated reserves. In this way the capital account had not been inflated by the adoption of the new plant. The amount of the contract was just over £37,000, to which had to be added the cost of the foundations and some minor details, which together brought the total up to about £40,000. The Engineer's original estimate of the annual saving was £6350; and there was every reason to believe, from the experimental working, that this would be fully realized. In the planning out of the scheme, and also its supervision, the services of Mr. Pooley, their Gas Engineer, had been invaluable. His time, ability, and energy had been given to the work without stint; and he had been ably seconded by his assistants. The Contractors had also carried out their work in a most able and satisfactory manner; and he desired, on behalf of the Committee, to publicly acknowledge and emphasize this fact. No pains would be spared by the Gas Committee, their officers, or the Contractors to make the plant perfect in every detail; and he said with confidence that the results of their efforts placed the Corporation in possession of one of the very finest gas-producing plants in this or any other country. He then formally declared the new works open.

Councillor G. E. Hilton, the Vice-Chairman of the Committee, who also responded, claimed that Leicester people possessed in their gas undertaking one of the finest in the country. The rates of the town had benefited over their period of ownership to the extent of no less than £851,203. The average gross profits of the concern over the last four years had been £101,523 per annum. If this sum were capitalized upon a 5 per cent. basis, the value of the undertaking, as a going concern, would be £2,034,600. As most of them were aware, the Corporation owned two complete gas-works, the smaller of which had been inspected that day. The works at Aylestone Road were divided into three sections, in two of which coal gas was manufactured; the third being devoted to the manufacture of carburetted water gas. At these works, where some 600 men were employed, the liquid products of manufacture from both Belgrave Gate and Aylestone Road works were dealt with. The other property of the Corporation under the control of the Gas Committee consisted of the central offices in Horsefair Street and the adjacent property which had recently been acquired, and a large piece of land at Thurmaston, which was held in reserve for future developments. There was laid in and about the borough over 302 miles of mains, from 2 inches to 36 inches in diameter. In the town and adjoining districts the conditions of supply had recently been very greatly improved by the judicious placing of district governors. The Committee had recently decided to lay down an extra high-pressure main which would encircle the busiest part of the town. One of its principal duties would be to equalize the pressures over this important area. Ordinary high-pressure mains had been laid in the central portion of the town; and the resulting business for shop window lighting, and to a small extent for street lighting, had proved a great financial success. There was no lighting extant which compared with the type of lamp installed, either for efficiency or economy.

Sir Edward Wood proposed the toast of "The Gas Committee, Engineer, and Contractors;" and Alderman Chaplin, J.P., responded on behalf of the Committee.

Mr. Pooley, in the course of his reply, observed that the means of carbonization adopted was continuous and as automatic as it was possible to make such an operation. The only time when the retorts were laid off from the making of gas was after the accumulation of carbon on their surfaces. They had so arranged things in Leicester that every retort was laid off for about one day in forty; and on that day the very small carbon formation was completely burned off. In this way, there were 39 out of the 40 retorts constantly at work; and they obtained between 1,200,000 and 1,400,000 cubic feet of gas daily from them. The cost in wages would amount to about 0·70d. per 1000 cubic feet produced. When the whole house was in operation next winter, the labour cost would be about 0·60d. per 1000 cubic feet of gas made. Eighty retorts had been installed. The furnaces for heating-up these were outside producers. The fuel guaranteed in these furnaces was 11 lbs. of coke for every 100 lbs. of coal carbonized. He had estimated that the vertical retorts would produce 12,500 cubic feet of gas per ton of coal. Their very short experience in Leicester with those now at work, however, led them to believe that the correct figure would be more nearly 13,500 cubic feet on the average for the year; and if this high standard was attained, the savings gained would be considerably above the estimate. The whole of the red bricks which had been used were of local manufacture; the silica goods came from Derbyshire; and the ordinary fire bricks and retorts from the Stourbridge district. Steel had been used very largely in the construction of the retort-house; and this material was very much in evidence throughout the plant. It was anticipated that the principal repairs which might be necessary in the next five years would be in the furnaces; retorts which had been working for that period being still in good order. Having referred to various engineering details of the work, Mr. Pooley added that the whole of the foundations had been carried out by Corporation workmen; and he was proud to say that there was not an eighth of an inch error anywhere. He concluded by paying a cordial tribute to those who had been associated with him in carrying out the work.

Mr. John West having responded on behalf of the Contractors,

Sir William Vincent proposed "The Visitors," for whom Col. C. H. Wright, J.P., of Stafford, replied.

PROVISIONAL ORDER INQUIRY IN GLASGOW.

The inquiry, under the Private Legislation Procedure (Scotland) Act, into the Order proposed by the Corporation of Glasgow opened on Tuesday last. Under the Order, the Corporation seek, among other matters, further powers in respect of the lighting of the city, and the allocation of the incidence of rates and charges for lighting streets, courts, and common stairs.

The Solicitor-General and Mr. Cooper, K.C., with Mr. Russell and Mr. Macquisten, appeared for the Corporation.

The Solicitor General pointed out, in opening the case, that the Act under which they worked was antiquated and required readjustment. He raised two principal questions. Did the facts connected with the present lighting arrangements show that the present law should be consolidated, and street lighting placed under one scheme of control? If so, then he thought it followed as a necessary consequence that a lighting assessment should be established. The present lighting arrangements of Glasgow took place under an Act of 1866, when the population was between 400,000 and 500,000; to-day it was over a million. The cost of lighting then was £26,000; to-day it was £136,000. Under the old Act the lighting arrangements were made with respect to three separate matters—the lighting of public streets, the lighting of private streets, and the lighting of common stairs. In the case of private streets, the owners erect and maintain the lamps, &c.; the Corporation supplying gas at a charge which was not to exceed 15s. per lamp. In regard to the common stairs, the owners provide the lamps, and the Corporation supply the gas and collect 10s., less 20 per cent. discount, from the owners; the latter having the right to recover the full 10s. from their tenants. He claimed common stairs as in the same position as a public street, which was open night and day to the public. The promoters considered that people having their doors on a common stair should be lighted to that door, as if it were a public street. There were some 900,000 citizens of Glasgow who reach their homes by means of the common stair, where there were 85,000 lamps fixed. Under the new Order it was proposed to relieve the proprietors of private streets of these duties under the 1866 Act, and to have a rate payable half by the owners and half by the tenants, which, under the present cost of lighting of £136,415, would come to 4·83d., or 2·415d. to be paid by the occupier and proprietor severally.

Lord Provost Stevenson, in the course of his evidence, stated that the Corporation thought that it was to the interest of the citizens that they should have full and efficient control of the lighting of the streets, including private streets and common stairs. It was proposed to allow eight years to elapse before this came into operation. There was no power to compel the owners to light the private streets properly. There were still rat-tailed burners in many stairs; and they were absolutely inefficient.

Mr. John Lindsay, the Town Clerk, stated that the Council were unanimously in favour of the Order, and that it was in the interests of safety of property; one lamp-post being worth an extra policeman any night.

Mr. S. B. Langlands, the Inspector of Lighting, stated that the Lighting Department of Glasgow controlled the lighting for a larger population than any other public authority. Within the City of London there were 2821 lamps; in Liverpool there were 21,000, which cost £54,743 annually; in Newcastle there were 10,178, which cost £29,446; in Leeds there were 10,477; in Glasgow there were 111,821, which cost £136,414 annually. The population of Glasgow was more than one fifth of the whole population of Scotland. In the event of a lamp required to be erected or repaired in a private street, it was necessary, in order to keep within the Statute, to obtain the consent of every proprietor. In 1913, there were 1000 cases of repairs in private streets and courts. The average number of communications sent out by his department was about 26 per repair. A statement was put in regarding the population residing in houses of not more than four rooms. This showed that in Glasgow the percentage was 87·29, in Edinburgh

71·24, Dundee 88·57, and Aberdeen 80·74, or an average percentage for the four burghs of 83·67.

During the evidence of Mr. Thomas Nisbet, Master of Works, the Chairman (Sir J. A. Dewar, Bart., M.P.) said that he did not think it would be denied that all the lighting arrangements of the city would be very much better if placed in the hands of the Corporation. The time had gone by when every owner was made responsible for street lighting. He invited Counsel to consider whether the proposal in regard to rating was a fair one, and so limit the length of the inquiry. Mr. Nisbet defined the common stair as a continuation of the foopath of the street up to the top of the tenement.

Mr. J. D. Borthwick, the Chamberlain and Treasurer, gave a number of figures regarding the cost of the lighting of the city, and in cross-examination stated that the deficit on the lighting of common stairs had fallen from £22,800 in 1907-8 to £14,800 in 1911-12.

Mr. John Harrison, President of the Glasgow House Owners' Association, gave evidence against the Order, and claimed that the proposal was not fair upon the owners.

On the conclusion of the evidence on the lighting clause, Counsel addressed the Commissioners, who intimated that they found the preamble proved, as regards the lighting, subject to the adjustment of the clause.

THE LABOUR TROUBLE AT LEEDS.

Special Strike Committee's Proposals Adopted with Modifications.

The Leeds City Council discussed at a long sitting last Friday the proposals of the Special Committee appointed during the labour troubles last December to control the affairs of the Corporation. These proposals were contained in the report which the Committee had undertaken to present; and they were given in the "JOURNAL" for the 17th inst. (p. 759). Briefly stated, they were that a General Purposes Committee of seven members should be appointed to take control of all labour-employing departments, in so far as concerns the engaging and dismissal of workmen, their wages, hours, and conditions of labour, and to reorganize the Cleansing and Highways Departments; that Mr. J. B. Hamilton, the Tramways Manager, be appointed an executive officer of the Committee at an additional salary of £500 a year; that fresh applicants for work under the Corporation should submit to medical examination; and that in future meetings of the Council should be held quarterly. The proposals were before the Council at a special meeting held on the 18th inst., as reported in the "JOURNAL" last week (p. 850); and their further consideration was adjourned till the 27th. The LORD MAYOR (Mr. E. A. Brotherton) presided.

The motion which was the subject of discussion, and which was moved at the previous sitting by Alderman C. H. Wilson, the Chairman of the Special Committee, was for the adoption of their report and of the recommendations contained therein.

Alderman G. RATCLIFFE (the Vice-Chairman of the Gas Committee) moved the following amendments:

1.—That the General Purposes Committee shal consist of nine members.

2.—That it be referred to the General Purposes Committee to receive recommendations from the labour-employing Committees of the Corporation in reference to—

(*a*) The appointment, control, and dismissal of all workmen.

(*b*) Wages, hours, and conditions of labour of all workmen.

(*c*) The distribution and supply of labour to the various departments, and to deal with such recommendations, and with all matters arising out of, or in connection with, the same, and to make recommendations thereon to the City Council for confirmation or otherwise by the City Council; and that three members shall form a quorum in that Committee.

3.—That the General Purposes Committee prepare and submit to the City Council a scheme for the reorganization of the Cleansing and Highways Departments.

4.—That recommendation No. 3 be not adopted and confirmed. [This recommendation proposed that Mr. J. B. Hamilton be appointed an executive officer of the General Purposes Committee, at a salary of £500 a year.]

5.—That recommendation No. 4 be amended as follows: That only applicants who are found suitable shall be permanently engaged; and that in all cases where, in the opinion of the General Purposes Committee, the occupation for which they are applicants is of a dangerous nature, the Committee may require the applicant to be medically examined.

6.—That recommendation No. 6 be not adopted and confirmed. [This recommendation was that the Council should meet quarterly.]

Alluding to the criticism of the equipment of the gas-works contained in the Committee's report, he admitted that much of the plant was obsolete, but said this was not the fault of the Gas Committee or of the late Manager. Every penny of the profits was taken; and these were inflated in the estimates, with the result that necessary repairs and renewals had to be put off. Proceeding to deal with his amendment, he referred first to his proposal that the General Purposes Committee should consist of nine instead of seven members, and said his object was to give the Labour party representation. Coming to the fourth clause, he said it meant the deletion of the Committee's recommendation in regard to Mr. Hamilton, whose appointment to the position suggested would not, in his opinion, work satisfactorily. With regard to the fifth clause, he said he thought the Council would be prepared to agree to its deletion. When they were engaging men to sweep the streets, it was ridiculous to ask them to bring a medical certificate. In the case of men who were to be employed in any dangerous occupation, the Council were within their rights in asking for a certificate. As to the sixth clause, he understood that the Committee's recommendation as to the quarterly meetings of the Council had been withdrawn.

Alderman WILSON said this was so.

Mr. J. CLARK, in seconding the amendment, dealt with the constitution of the Committee, the proposed appointment of Mr. Hamilton, and the suggested medical examination.

After considerable discussion,

Alderman WILSON moved the closure.

Alderman FORD seconded, and the motion was carried amid loud protests from the Labour members.

Voting then took place on the separate clauses of the amendment. The first four were defeated; the fifth was accepted by Alderman Wilson and his colleagues on the Special Committee; and as they had already consented to the withdrawal of their recommendation in regard to the Council meetings, the sixth clause was not put. As the result of this decision, Alderman Wilson proposed to add to the second clause of his resolution the words "and that such Committee report monthly to the Council." Considerable discussion took place on the question of the addition of the words "for confirmation." The Town Clerk (Sir Robert E. Fox), on being appealed to, pointed out that, according to the wording of the resolution as it stood, the Committee were not bound to bring up their report for confirmation; but they had discretion as to whether or not they would do so. Ultimately Alderman Wilson agreed to the addition of the words, but said he did so under protest. The resolution, with the modifications indicated, was then put, and carried by 34 votes to 21.

The constitution of the General Purposes Committee gave rise to some discussion. Eventually the matter was adjourned until the following Wednesday (to-morrow), when the monthly meeting of the Council will be held.

Strike Expenses and the Trading Concerns.

It appears that, contrary to expectations, the heavy expenses incurred by the Corporation during the strike will not lead to an increase in the rates. At a meeting of the Finance Committee held last Friday to consider the estimates for the coming year, it was decided to recommend to the Council the levying of a rate of 9s. 1d. in the pound—the same as last year. The burden on the rates of the strike expenses is lighter than it might have been owing to the liberation, as the result of a decision of the High Court, of £34,030 which had been set aside some years ago for income-tax payments. This, of course, reduces the amount which the ratepayers have to contribute for defraying the cost of fighting the strike; but still the amount required by the city is higher than the sum raised last year. The rate remains stationary by reason of the fact that the amount required by the Guardians is correspondingly less. The poor rate for the year will be 1s. 7d., compared with 1s. 8½d. last year; and the rate for municipal purposes is to be 7s. 6d., against 7s. 4½d.

The effect of the strike on the municipal trading concerns is revealed in figures which were placed before the Committee. In the Gas Department, the profit for the year was estimated twelve months ago at £30,000. The accounts show that there is instead a deficiency of £9170. In both the Electricity and Water Departments the profits are about £15,000 on each concern, though they were estimated at £16,000 each. The tramways have yielded the best results. In this department the profit is £70,000, against an estimated profit of £66,000. In the estimates for the coming year, the Committee have not included any profits from the Gas Department. It is stated that probably there will not be any surplus on that undertaking, and there is some likelihood of an increase in the gas charges.

BELFAST GAS-WORKS EXTENSION.

Huge Claim under Traverse.

At the Belfast Assizes, on the 23rd, 24th, and 25th inst., before Lord Chief Justice CHERRY and a Jury, Messrs. J. F. M'Cue and T. Dick, trading as M'Cue, Dick, and Co., of Cromac Sawmills, Belfast, traversed an award of the Irish Local Government Arbitrator, in respect of premises acquired by the Corporation for the gas-works. The award was for £8640; the claim now set up being £24,315.

Mr. J. H. CAMPBELL, K.C., M.P., for the plaintiffs, said the traversers were comparatively young men, who, in 1906, started business for themselves. The business so rapidly developed that they acquired the Cromac Mills in 1908 on a lease for thirty years; and they took over stock-in-trade and book debts. For the first ten years the rent reserved was £150 a year, and for the next twenty years it was to be £180 a year. At the expiration of the lease, they were to have the option of renewing it for five additional years at a rent of £250 a year. The premises were unique from their central position, and from the fact that they had a front to Blackstaff River, while adjoining was a large tract of land for storage purposes. Further, the premises were close to the Great Northern Railway and the markets.

Mr. JOHN GORDON, K.C., M.P., for the Corporation, said that body thought the award of the Arbitrator too high, and asked the Jury to reduce it. A rumour had been circulated that the Corporation had made a large offer to the claimants; but this was not so. On the contrary, the amount of £8640 was regarded as extravagant. Counsel thought his friends on the other side should be ashamed of the claim for £24,000. The Corporation were not taking over the members of the firm. They were taking the business itself, which, as far as they could see, was worth £1000 or £1100 a year; and at three years' purchase—a large allowance—this would amount to about £3000. This was for "lock, stock, and barrel." What would they give when the claimants carried the business away with them, and were relieved of competition in the old premises? It was amazing to expect eight years' purchase for the business. All that the firm could hope for was compensation for what they were entitled to under the lease, the cost of removal, and any possible injury sustained by interference with their business. With the sum arrived at by the Jury in respect to these matters the Corporation would be content.

Evidence for the Corporation having been given,

His LORDSHIP put to the Jury two questions: (1) A general question of compensation, and the total amount to be awarded in all matters; and (2) the amount of compensation (if any) the traversers were entitled to in respect of the alleged loss in connection with cargoes which they were negotiating to purchase.

In the result, the Jury found for the traversers in the sum of £10,240.

VERTICAL RETORTS AND OTHER EXTENSIONS AT SALFORD.

To-morrow (Wednesday) the Salford Corporation will be asked to confirm a resolution of the Gas Committee which provides for a large scheme of extensions.

The Gas Committee have (says our Manchester correspondent) accepted the tender of West's Gas Improvement Company, Limited, of Manchester, for the supply and erection at the Regent Road Gas-Works of an installation of Glover-West vertical retorts, with all the necessary machinery and apparatus, for (approximately) £25,720.

The Council will also be asked to confirm the Gas Committee's recommendation that application be made to the Local Government Board for sanction to borrow £70,000 for expenditure on mains, services, meters (ordinary and prepayment), cookers, and fires, required for the undertaking during the three years ending March 31, 1917.

BRITISH GASLIGHT COMPANY, LIMITED.

Adverse Conditions and a Reduced Profit—Woodall-Duckham Retorts for Hull—The Company's Bill in Parliament Agreed to by the Hull Corporation.

The Half-Yearly General Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, as well as the report of the Directors, and (in compliance with the Act of Parliament) the accounts alluding to the Norwich station. The report of the Directors was as follows:

The Directors submit the half-yearly accounts of the Company to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the investments held by the Company.

The available profit is £28,279 19s. 11d., after deducting (omitting shillings and pence) the following sums: Income-tax, £2165; Hull debenture interest, £2118; Norwich debenture interest, £1779; Potteries debenture iuterest, £659; Trowbridge debenture interest, £164; and interest on debenture stock, £2260—total, £9147 9s. 5d.

HULL.—The gas-rental shows an increase of £1200, as compared with the corresponding period of 1912; the price of gas having been the same—viz., 1s. 10d. per 1000 cubic feet. Coke shows a decrease of £904; tar and tar distilling, an increase of £1199; and ammoniacal liquor and sulphate of ammonia, a decrease of £418. Coals have cost 14s. 11d. per ton, as against 12s. 11d. Coke has realized 12s. 1d. per ton, as against 12s. 11d. The gas sold shows an increase of 12,242,965 cubic feet—equal to 1·59 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 43,177,000 cubic feet; being 3,238,000 cubic feet less than in the same period of 1912. The profit realized, after writing off the sum of £3266, the balance of the amount to be charged to revenue for alteration and extension of works, is £7686 less than the parliamentary interest. This sum has been taken from the reserve fund, leaving £32,687 to the credit of that account.

NORWICH.—The gas-rental shows a decrease of £1774, as compared with that of the corresponding period of 1912; the price of gas having been the same—viz., 2s. 10d. per 1000 cubic feet, with reductions for gas used for manufacturing purposes. Coke shows a decrease of £834, and tar and ammoniacal liquor a decrease of £705. Coals have cost 18s. 4d. per ton, as against 16s. 2d. Coke has realized 15s. 8d. per ton, against 16s. 1d. The gas sold shows a decrease of 12,745,500 cubic feet—equal to 4·62 per cent. The profit realized is £138 less than the parliamentary interest.

POTTERIES.—The gas-rental shows an increase of £522, as compared with that of the corresponding period of 1912; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet, with a rebate of 3d. per 1000 cubic feet for prompt payment. Special discounts to large consumers and to consumers of gas for power purposes are also allowed. Coke shows an increase of £795; tar, an increase of £225; and ammoniacal liquor and sulphate of ammonia, a decrease of £450. Coals have cost 13s. 5d. per ton, as against 12s. Coke has realized 11s. 9d. per ton, as against 10s. 6d. The gas sold shows an increase of 4,146,976 cubic feet—equal to 2·20 per cent. The profit realized, after writing off the sum of £910, on account of old gasholders now demolished, is £2660 less than the parliamentary interest.

TROWBRIDGE.—The gas-rental shows an increase of £33, as compared with that of the corresponding period of 1912; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £250. Coals have cost 18s. 9d. per ton, as against 17s. 5d. Coke has realized 13s. 9d., against 15s. 4d. per ton. The gas sold shows an increase of 262,333 cubic feet—equal to 0·69 per cent. The profit realized is £204 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows a net decrease of £82; the price of gas having been reduced on July 1 last from 4s. 9d. per 1000 cubic feet, with discounts, to 4s. 2d. per 1000 cubic feet, with discounts. Residual products show a decrease of £34. The profit realized is £517.

The available profit, added to the previous balance of profit and loss, amounts to £103,457. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, both less income-tax. The dividend and bonus will amount to £31,192, and leave a balance of £72,264.

The CHAIRMAN moved the adoption of the Directors' report. In doing so, he said he felt in a somewhat different position from that in which the Chairman of the Company was usually placed when he met the shareholders, because he had not on this occasion an entirely satisfactory report to present. There was no doubt the Directors of the Company were in much the same situation as that in which a great number of the directors of other companies had been when meeting their shareholders, so far as the accounts for the past half year were concerned. The reason was obvious to those of the shareholders who were intimately interested in gas accounts, and who read the reports of other gas companies in the Press, as these showed that the Directors were not responsible for the partially unsatisfactory report which was before them. They had had to fight against very dear coals; and the extraordinary thing was that, with dear coals, there had been great difficulty in selling coke. As a business man, he had always thought that, when one class of fuel was high in price, another class of fuel ought also to be high in its market value. But this had not been the case during the past six months; and the Company had had, in some instances, to pay over 2s. per ton more for coal, while they had been receiving nearly 1s. less for their coke. The same state of things applied to sulphate of ammonia. There had been a considerable fall in its market value during the past six months; and he regretted to say that the price was still falling, so that the outlook was not a very bright one for the current half year. With reference to Hull—which was the Company's largest station—the increase of business was fairly satisfactory considering the very warm and dry six months in which they had had to work; but in regard to the Company's general increase, the total was rather more than 4 million cubic feet, compared with the corresponding period of the previous year. This was not entirely unsatisfactory, because in the six months to December, 1912, they had an increase in the consumption of over 6 per cent. on the corresponding period of 1911. As the shareholders were aware, the Company had had a very large reserve fund at Hull—in fact, complaints had been made by the Corporation that the reserve fund was too large at this station. But it was a very desirable provision. The fund was nothing less than surplus profits made in past years; and from it the Directors were able to draw the sum needed to make up the amount of parliamentary profit. It was distinctly stated in the report that the amount they had to draw was £7686; but there would remain in the fund the sum of £32,687 for further use. The total profits of the Company for the half year were rather less than usual; and they were absolutely less than was required to pay the dividends recommended. But like prudent Directors, and with the sanction of the shareholders, they had in past years been accumulating what he might call the "rest" of the Company, which now stood in the account at £103,457. This sum had been built-up, so that it might be a kind of dividend reserve fund, from which the Directors could draw to compensate the requirements for dividend as and when occasion should arise. He was quite sure the shareholders would approve of what the Board proposed to do, which was to draw the sum of £2912 from this very large figure to make up the amount needed for dividend and bonus. Reverting to the affairs of Hull, they found themselves in this position: A large amount of capital would have to be spent over the next two or three years, because, in regard to manufacturing plant, they were at the end of their resources. Last winter they had a very small reserve indeed to carry them on. Therefore, it was essential that they should dismantle one of the older retort-houses, and convert it to one of the more modern carbonizing systems; and so they had decided to adopt the Woodall-Duckham retort system, which the Board hoped would be a great success. To enable them to carry out the work required a very considerable amount of capital; and the capital was slightly over-expended at Hull. Those of the shareholders who attended a meeting held a short time ago would remember there was then read a Bill which the Company were promoting in Parliament for the express purpose of providing fresh capital for Hull. Naturally, the Corporation petitioned against the Bill. The Directors, however, had a suggestion from the Corporation that the Directors should meet representatives of their body on the subject. The gentlemen representing the Corporation came up to London; and with them the Directors had a most charming interview. What they had to say was very complimentary to the Company. He really hardly liked to tell the shareholders the favourable terms in which the Company were spoken of by the Corporation representatives. But the result was that the Corporation withdrew their petition against the Bill. The only point on which the Directors gave way was to reduce the capital from £400,000 to £300,000; while the Corporation representatives gave way on the other questions raised in the petition. This was most satisfactory. The Directors had endeavoured on all occasions to be on friendly terms with the Corporation of Hull; and the Engineers and Managers had likewise followed the Board's instructions in this regard. At the Potteries station, they were having a change in the management. Mr. Heath, who had been in the Company's service for 35 years (16 years as Manager), had, during the last two or three years, been in very bad health indeed. The Board had given Mr. Heath every possible advantage in his holidays, and in other ways, to see if he could get well; and his health had improved a little lately. But it was not in the condition in which it was desirable it should be when they considered what a difficult and anxious time he had in working at the Potteries. They had granted Mr. Heath a retiring allowance. As the result of an advertisement for a new Manager, there were 52 applications for the post; and the Directors had selected for the vacancy Mr. Harold E. Copp, who was at present the Gas Engineer at West Bromwich. The Directors had seen Mr. Copp, and they felt certain he would prove a satisfactory Engineer and Manager for their Potteries station. There was one other general matter to which he should like to refer. A shareholder had written him a letter, which he was very glad to receive, because it showed that the shareholder in question took an intelligent interest in the work of the Company, quite apart from his dividends. He (the Chairman) would like to read what this shareholder said. He was talking about the various stations, with the exception of Hull, which were not earning their dividends, nor contributing anything to the reserve account. He said:

> I have been afraid this was the case from examining the previous balance-sheets, and I have read the report of the Chairman's speech at each meeting, hoping to get enlightenment on the matter. This is a point he never touches upon; and it seems to me to be an essential point for the shareholders' consideration. I shall be glad if you will ask the Chairman to deal with the matter at the next meeting. It would be of interest to the shareholders to know why a price is not charged for gas at each station which would enable the full profit to be earned, and also something to be carried to the reserve account. It would be satisfactory to the shareholders to know that the reserve fund of each station is as full as allowed by Act of Parliament.

As a man of business, he (the Chairman) thought he could speak perfectly plainly on the subject. To enable the Company to make gas popular, and enable the shareholders to get dividends, they must sell gas at a cheap rate, and this had been the earnest desire and inclination of the Directors for a great number of years. In fact, the Company had been frequently pointed to as selling gas at Hull at a very low figure. They had also, during the past few years, reduced the price very considerably at Norwich, and largely, too, at the Potteries. Everywhere where they were doing business, their desire was not to

stop the sale of gas, but to increase it; and this could only be done by selling gas cheaply. It was perfectly true that, by raising the price at the different stations, it might be possible, but not probable, in view of the competition of the electric light, that the full amount to the last penny required could be earned, and the reserve fund be built up as his shareholder correspondent seemed to wish. But he (the Chairman) did think that a matter of this sort must be left to the Directors. The Directors felt the pulse of the districts they were supplying, and they learned through their managers the right policy to pursue. It was really a matter of policy; and in the case of gas companies, the best policy was to sell gas as cheaply as possible. He (the Chairman) had, in conclusion, as usual, to give the shareholders a few statistics as to the position of the Company; and he had had some figures taken out as to the progress made during the past decade. At Hull, ten years ago, the Company were selling 1107 million cubic feet of gas; and last year they sold there 1552 million cubic feet. Ten years ago they had 28,000 consumers; now they had 48,000. He wished particularly to draw attention to the average annual consumption of gas through slot meters, because it was really very remarkable. Ten years ago the average consumption was 12,800 cubic feet; and now it was 16,169 cubic feet. This was a notably high figure, and compared very favourably with their other stations at Norwich and the Potteries. This only showed that the intelligent working men of Hull understood the value of gas—especially of gas at such a low price as they were charging at Hull. At Norwich, the average ten years ago was 10,265 cubic feet; now it was 11,218 feet. At the Potteries, it had in the ten years increased from 10,440 cubic feet to 10,858 feet. He was afraid he had been rather longer on this occasion than he was usually; but as the shareholders had heard, there were several interesting matters upon which he had had to touch.

Mr. Frederick Wilkin seconded the motion.

The Chairman, replying to Mr. Charles Webb, said the Directors had not made any arrangements with regard to the supply of coal under a new contract, because the Company's present contract would carry them on to June or July. Of course, like other gas company directors, the Board were exceedingly anxious to see coal prices come down; and they hoped to get at least 18d. per ton off the price. But there was the trouble in South Yorkshire, which they hoped would not prevent the Company getting a reduction. As to the make of gas per ton, this depended entirely on the coal used. At Hull, where South Yorkshire coal was employed, they made about 11,600 cubic feet per ton. At Norwich they obtained much the same as at Hull. At the Potteries they used a poorer coal; and they only got 10,800 cubic feet per ton.

The motion was unanimously carried.

Moved by the Chairman, and seconded by Major-General Corrie, a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, both less income-tax, were declared.

Mr. Richard Stevens thought the shareholders might congratulate themselves upon the accounts. Although not fully earned, they were to receive the usual dividend; and the prospects of the Company were exceedingly hopeful. He had therefore great pleasure in proposing a hearty vote of thanks to the Chairman and Directors for their management of the business of the Company; and at the same time the shareholders would extend their hearty congratulations to the Chairman upon seeing him restored to health and in his accustomed place, which he filled with so much distinction.

Mr. Kenneth R. Mackay seconded the motion, which was cordially carried.

The Chairman said, in the name of his colleagues and of himself, he was much obliged to the shareholders for their kind vote. This was the largest meeting of shareholders they had had for many half years; but as they had 1900 shareholders, the proportion present that day was very small.

Sir Corbet Woodall proposed that the thanks of the shareholders be given to the officers of the Company both at the stations and in London. He remarked that the speech of the Chairman certainly made the most of the small deficiency they had to face that day. Having regard to the experience of gas companies up and down the country, he thought the fact that they had to withdraw from their reserve less than £3000 was not a matter about which they need be very much concerned. He (Sir Corbet) was struck by the letter from a shareholder to the Chairman. The shareholder appeared to regard the conduct of gas undertakings as a matter of a very simple and elementary character—that all they had to do at such times as these was to put the price up, and "there you are." If this policy had been followed by gas companies generally, the industry would not be what it was to-day. The Company recognized it had obligations to fulfil, as well as privileges to enjoy; and if they were to continue to carry on the success that had attended it, it would not be on the lines of their friend's letter. All the Company's officers were imbued with the sense that it was a pride, as well as a duty, to conduct the business of the Company so that the consumers might be thoroughly well satisfied. He was glad to confirm what the Chairman said with regard to the new appointment made to the Potteries station. The high level their men in the different towns had always held would not be lowered by the appointment of Mr. Copp to office. To their Secretary and the London staff their acknowledgments were also due.

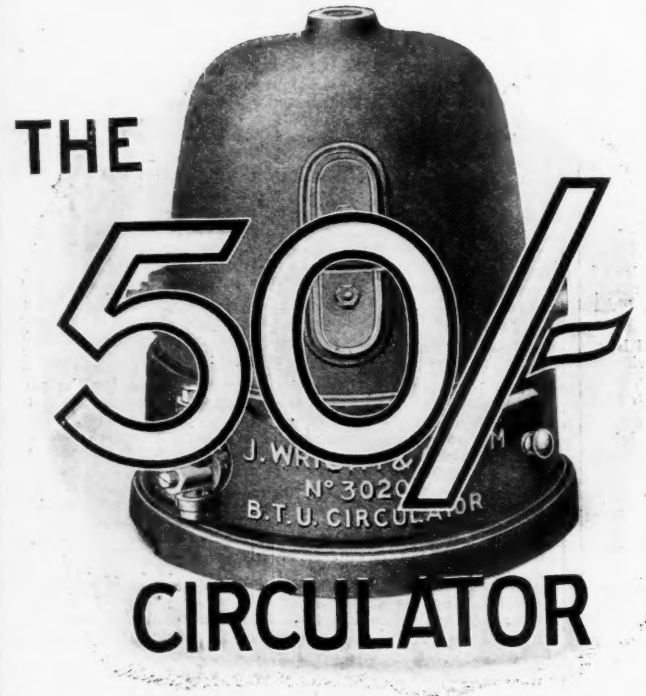
Mr. R. S. Gardiner seconded the motion, which was carried.

The Secretary said he was very pleased to respond to the vote of thanks; and it would be a further pleasure to him to communicate the vote to the several officers at the stations, who would all greatly appreciate it, as he did himself.

Last week the spring meeting of the Advertisers' Golfing Society was held at Purley Downs. The 36-holes competition for the challenge cup offered by "The Times" newspaper was won by Mr. Cyril G. Davis with a score of 90 and 93, less 20, or 163 net. The captain's prize (given by Lord Northcliffe, for the best morning round under handicap) was also won by Mr. Davis with 90 less 10—80 net.

THE ERA OF THE 50/- BOILER

FOR MONTHS the "B.T.U." has been pointing the way.



Now that others are following suit, 50/- Boilers will soon be the order of the day.

This means Gas Boilers will become as general as Gas Cookers - - -

Thanks to the policy inaugurated by the "B.T.U."

JOHN WRIGHT & CO.,
Essex & Eureka works,
BIRMINGHAM.

CONGRATULATIONS AT CROMER.

The annual meeting of the Cromer Gas Company, which was held locally last Tuesday, was a harmonious affair; the shareholders being evidently well satisfied with the state of matters as revealed by the report, and by the remarks of the Chairman, Mr. E. L. Burton.

The report was in the following terms: "The improved and more modern methods of business introduced towards the end of 1912, and the reduction in the price of gas which took effect as from Jan. 1, 1913, have been followed by encouraging results; the sale of gas for the year 1913 showing the substantial increase of 2,653,900 cubic feet, or 11·3 per cent., over that for the previous year, and the total receipts an increase of £361. These figures are the more satisfactory in that several adverse factors have had to be met; for while the average cost of the coal carbonized has risen 1s. 6d. per ton, owing to the enhanced prices paid by the Company, the residuals market has been unfavourable, added to which the Cromer season was distinctly disappointing, the letting of houses and apartments having been much below the average. The accounts for the year 1913 show a balance at the credit of the revenue account of £1335. After charging £518 for interest and income-tax, a sum of £817 is added to the profit and loss account. This, together with the balance of £143 brought forward from 1912, gives a disposable profit of £960. The Directors have appropriated £400 of the profit to the reduction of the suspense account (now standing at £1600), which leaves a sum of £560 available for division. The Directors accordingly recommend that a dividend of 1 per cent. per annum on the ordinary stock (less income-tax) be declared for the year ended Dec. 31, 1913. This will require a sum of £418, and leave £142 to the credit of the profit and loss account to be carried forward. The Directors recently decided, in pursuance of the Company's statutory powers, to lay a main from East Runton to West Runton. This extension has now been completed; and consumers in West Runton are already being supplied with gas. It is anticipated a remunerative addition to the Company's business will result therefrom. The works and plant have been maintained in good order; and their condition, as well as the excellent carbonizing results obtained, reflect great credit upon Mr. Smallbone, the Engineer. Mr. James Lovelace, who has been Chairman of the Directors since 1902, having resigned the position, has been elected Deputy-Chairman; and Mr. E. L. Burton has been elected Chairman in his stead. Mr. P. E. Hansell, having retired from the Secretaryship (an office he has held for the long period of 35 years) has been elected a member of the Board. The Directors desire to place on record their satisfaction at having thus secured for the Company a continuance of his valued services. Mr. F. Smallbone has been appointed to the vacant office, and will in future act in the joint capacity of Secretary and Manager."

The Chairman drew attention to the fact that the unaccounted-for gas had been reduced, and acknowledged the indebtedness of the Company to Mr. Smallbone for the results obtained. Mr. Mitchell said the report was most gratifying. In acknowledging a vote placing on record the appreciation of his services as Chairman, Mr. Lovelace remarked that this was certainly the pleasantest annual meeting for some time. They had left the troubled, and were now in smoother waters.

WELLINGTON (N.Z.) GAS COMPANY, LIMITED.

Continued progress during the year 1913 was reported by the Chairman of this Company (Mr. D. J. Nathan) at the forty-fourth annual meeting. A strike of waterside workers rendered it difficult at one time to obtain a supply of coal; but by the aid of reserve stocks and an increased make of carburetted water gas, the management succeeded in maintaining the supply—and without making any increase in the charge. He said that, as they had to purchase inferior coals at high prices—the full effect of which would not be felt until the current year—the Directors had, after allowing for the known loss in 1913, placed the sum of £3000 to a special suspense account, to be drawn against during 1914. As the results obtained from the vertical retorts installed at Miramar continued to be good, both as to output and economy of work, the Board decided in October to order a further unit for erection at Miramar. While the present unit had a maximum output of 750,000 cubic feet per diem, the new unit would be larger, and would have a maximum output of 1,400,000 feet in 24 hours. The sales of gas continued to show a gratifying increase, having amounted to 6 per cent. during the year. There were 609 new services laid, as compared with 670 the previous year; while 927 new gas-cookers were fixed, compared with 801. Owing to the economy effected in the manufacture of gas at the new works, the Directors felt themselves justified in making a substantial reduction in the price of gas. As from April 1, the rates of discount allowed on gas used for manufacturing and for power purposes was increased—thus materially reducing the cost to large consumers—and from Sept. 1 the rate for gas to ordinary consumers was reduced from 5s. 5d. to 5s. net per 1000 cubic feet.

The report stated that the balance at credit of profit and loss account was £40,537, out of which £6250 was placed to suspense account—including £2000 as part cost of dismantling the city works. The payment of a dividend of 10 per cent. for the year on the ordinary shares would leave £22,498 to be carried forward.

It was mentioned during the proceedings that the Secretary (Mr. J. H. Helliwell), who has been connected with the Company for over thirty years, has been granted six months' holiday. Mr. Helliwell is in hopes that while in Great Britain he may obtain knowledge which will be of benefit to the Company.

The Directors of the Bombay Gas Company recommend a dividend of 4½ per cent. (less income-tax) for the half year ended Dec. 31—making, with the interim dividend, 7½ per cent. for the year.

30-40 Series.

THE MAIN SPRING.

AFTER Winter departs Cookers alone, of various gas appliances, are in constant daily use in the ordinary household.

Upon the Gas Cookers that you provide for your consumers, therefore, depends the maintenance of your output.

Satisfaction-giving Cookers — "Main" Cookers—form the Main Spring, the force that maintains your sales in the Summer.

Make arrangements to provide your consumers with "Main" Cookers now, and before Autumn comes you will have reaped the benefit.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

THE RECENT BLACKBURN STRIKE.

The Blackburn municipal strike has not yet been satisfactorily disposed of. Following a statement issued by the Town Clerk (Mr. Lewis Beard) a few days ago, in regard to the reinstatement of 46 men whom it was alleged had not been reinstated in accordance with the strike settlement agreement, a reply was sent by Mr. J. R. Clynes, M.P., the Lancashire Secretary of the National Union of Gas Workers, in which he remarked that the treatment of the men had been distinctly unfair, and quite contrary to the terms of settlement. The General Purposes and other Committees met during the week to consider the complaints. No official statement has been made as to the result of the deliberations; but it is understood that the Committees concerned pointed out that the reorganization of departments dispensed with the services of a number of men, and the work of others was only casual and seasonal in character, and that the reinstatement of such as are required is being made as necessity for their services is felt.

In the "JOURNAL" for the 3rd inst. [p. 605] was given a list of the expenditure incurred by the Special Sub-Committee entrusted to deal with the strike, which showed that the extra costs incurred in keeping the gas-works going to the end of the first week in February amounted to £7350; £1354 of this being for wages. A supplementary list of expenses is to be presented for approval at the next meeting of the Council. It amounts to about £2600.

THE STRIKE AT FLETCHER, RUSSELL, AND CO.'S.

The strike of the employees at the Warrington works of Messrs. Fletcher, Russell, and Co. entered on its fifth week yesterday. At the week-end, there was an important development; our Manchester correspondent being officially informed that the firm had consented to receive a deputation of the recalcitrant workmen to discuss the situation. This decision, however, was adopted "without prejudice to the requirement of the Board that when at other times any workman has any complaint to make he shall make it through his foreman as the proper channel." The point at issue is "recognition" of the men's Unions by the firm; wages and working conditions do not enter into the question at all. The deputation was to wait on the firm yesterday, and was to consist of twelve workmen—one from each department.

Exmouth Gas Company.—The statement was made at the annual meeting of this Company that a new contract extending over ten years has been entered into with the Exmouth Urban District Council for the public lighting. The total number of ordinary consumers is 1388, and of prepayment consumers 1490—the respective increases being 79 and 111. There are 536 public lamps. The usual dividends on the various classes of stock were declared.

HEATING OF BAKERS' OVENS.

Comparative Value of Gas and Coke as Fuels.

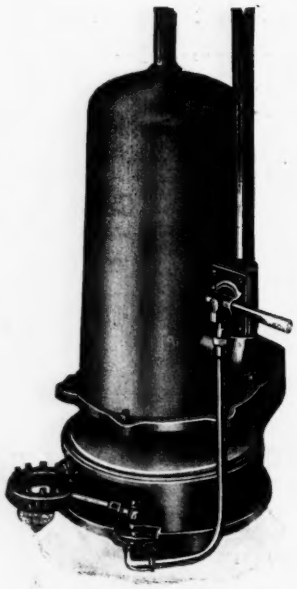
Before the Manchester Bakery Students' Society, at a recent meeting, Professor F. S. SINNATT, F.C.S., delivered a lecture on "Fuels and the Economic Firing of Ovens."

In the course of his remarks the lecturer said a number of scientific bodies were devoting much attention to the economic firing of ovens, because it was felt that there was a great deal of unnecessary waste, and it was only by experiment that remedies could be brought about. They had to consider the subject of fuel from a very wide point of view; and in this category they had coke and gas. He felt certain that gas would in future play an important part in the bakeries in this country, just as it had done in the French capital. In 1913 the use of gas in Paris had developed to an enormous extent—in fact, 37 additional bakeries had adopted gas for heating purposes.

There could be no doubt that coke was the best solid fuel available; but it was continually changing in its composition, owing to the fact that the gas industry was developing. Coke contained a certain amount of volatile matter and a certain quantity of gas; but those engaged in producing gas now aimed at getting out of the coke as much of this commodity as possible. This made it more difficult to start a coke fire, for the coke suffered as a result of the treatment it was subjected to in the making. Coke absorbed a large amount of water, which might cause a loss of 3d. per ton; and if it contained 25 per cent. this would equal a loss of 6s. 3d. Coke could be burned well and also badly; and it was frequently in the bakery the chief source of loss of heat. They must consider the amount of draught in the chimney, for on this depended greatly the satisfactory burning of coke. The depth of fuel should be kept as near 8 inches as possible, and not more than 11 or 12 inches. Coke should also be a certain size—about the size of an egg. It was worth while breaking it into such small portions, and, moreover, the Manchester Gas Department had put in an extremely costly plant for the sizing of coke. This was an important thing in connection with the burning of coke; and bakers should see that they got it in small portions.

Reverting to the subject of heating by gas, the lecturer said it was sure to become more and more general. The price was being gradually reduced, and this was the tendency in the gas industry—the idea being that it should be cheap enough for everyone to use. Personally, he did not see why bakers should not use it in heating large ovens. It was certainly most convenient, it was easy to manipulate, and could be controlled with the greatest accuracy and exactness. The gas could be turned out quickly and at any time, and a high temperature could be secured. Gas was also very clean, left no ashes, and did not cause any dust in the flues. It was possible to obtain from it far more heat, and it was also more efficient. The cost was the great difficulty; but there was no reason why it should not be used in conjunction with

The Maintenance of the IRONCLAD ends where it begins.



The IRONCLAD with Capsule Thermostat.

This may sound paradoxical, but it is absolutely true, for there is little or no maintenance with the IRONCLAD,

Because the IRONCLAD has VERTICAL Heat and Water Surfaces—eliminating deposit.

No interior baffles or other obstacles to complicate or impair working.

The finest IRON Castings without joints or seams.

Test the IRONCLAD. The first All Iron Circulator at a moderate price.

THE Richmond GAS STOVE & METER Co. LTD

WARRINGTON AND LONDON.

The FIVE PARTS of the IRONCLAD.

power. The initial cost would be great, though its use would remove many little difficulties and save a lot of waste, &c. Ovens could be economically heated by gas, by coal gas, if the matter was tackled in a proper manner; and producer gas was valuable for getting power.

In the course of a discussion which followed the lecture, Mr. J. Black described various ovens; and Professor Sinnatt, in answer to a question, said he believed the future use of gas as a means of heating bakers' ovens would depend upon the baker who had two or three ovens being able to employ it cheaply in preference to coke. Mr. T. Bradley said he did not think there was sufficient competition for the supply of coke. He used gas coke, and found it contained about 22 per cent. of moisture. The lecturer said it should not contain more than 6 per cent.

In proposing a vote of thanks to Professor Sinnatt, Mr. J. Jordan (the President of the Manchester Master Bakers' Association) said he got the best results with regular fires, and when the coke was 6 or 8 inches deep. The only difficulty was when too much fuel was piled on. Sometimes coke came to the bakeries in a very dry condition, and sometimes very wet; but he had noticed that when it was dry there was a little more "top" on the loaves. He would get gas coke, broken in small pieces, and give it a trial for a month in conjunction with ordinary coke, and would take note of the difference. Mr. Bradley pointed out that coke varied a great deal, and said perhaps it would pay the bakers to get better qualities, and get it dry. Acknowledging the vote, the lecturer intimated that it was his intention to test samples, and said that possibly on some future occasion he would have the privilege of discussing the subject further with the members of the Society. It was certainly not right for anyone to sell coke containing 25 per cent. of water.

NOTTINGHAM'S PROJECTED "PALACE OF LIGHT."

Much was heard recently of a scheme for the holding of a Universal Exhibition at Nottingham during the summer of the present year; a salient feature of the project being the arrangement of a "Palace of Light" designed to illustrate especially the latest types of gas illumination. An admirable site had been secured upon lease, and the work of preparation had until recently been in progress. The interest manifested by the Chairman of the Nottingham Corporation Gas Committee and the Engineer and Manager of the undertaking was understood to indicate the readiness of the responsible local authorities to extend their co-operation, more particularly in regard to the special department mentioned. It was suggested by the promoters that Nottingham tradespeople would necessarily substantially benefit from the large influx of visitors; and there was the additional encouraging promise forthcoming that a proportion of the revenue of the exhibition should be devoted to local charities.

But, despite the anticipations indulged in at the inaugural function, the whole thing has fallen curiously flat; the official announcement now being forthcoming that the exhibition as originally planned will not be held this year. The reason assigned is the extreme paucity of local financial support. It is suggested, however, that, as much of the constructional work for the main building has already been completed, it might be employed this year for a smaller exhibition dealing mainly with mining—leaving the larger display until 1915. The exhibition in its initial stages this year might also, it is proposed, take within its scope allied industries relating to gas lighting, heating, &c. But the original idea as to a comprehensive arrangement justifying the title of a "Palace of Light," appears for the present incapable of realization, though it is understood there had been a fair number of preliminary inquiries and applications made by manufacturers of gas appliances in several parts of the country.

RUTHERGLEN STREET LIGHTING.

The Rutherglen Corporation have now practically completed their low-pressure street lighting scheme; and last Tuesday evening the "turning-on" function was successfully accomplished in the presence of Provost A. K. Rodger, Councillor Miller (the Convener of the Lighting Committee), and a large number of guests, including Mr. C. H. Macfarlane, the Burgh Surveyor, and other officials.

There are in operation about 630 two-burner lamps of 100-candle power each, and 17 Graetzin three-burner lamps of 1000-candle power each—emitting a total light of 80,000 candles, as against 10,000-candle power formerly. The illumination of Main Street is very brilliant, when compared with that of days which are now of the past. The method of working is known as the three-pressure-wave system—the first wave lighting up all the lamps (even quicker than by electricity), the second wave at 11 p.m. extinguishing all burners but one in each lamp, and the third wave extinguishing at dawn of day all the remaining burners. This is the first application to such large lamps as 1000-candle power of the Alder and Mackay apparatus.

DUBLIN ELECTRICITY UNDERTAKING.

Decreased Surplus and No Relief of Rates.

A report of the Estates and Finance Committee of the Dublin Corporation on the estimates for the year ending in March, 1915, states that the electricity account shows that at the close of the current year, instead of having a surplus of £26,072 to bring forward, only £11,861 is estimated to be available. This is attributed to expenditure in excess of estimates, a drop of £3672 in revenue from private consumers, special expenditure of £1437, and to the fact that of the

LOOK OUT

FOR DETAILS of a Striking Development in connection with Gas Cookers—the result of Two Years' Scientific Investigation by our Technical Staff—which will be published at an early date.

THE DAVIS GAS STOVE CO., LTD.,
59, Queen Victoria Street,
LONDON,
E.C.

surplus of £10,998 estimated for the year ended March 31, 1913, only £5439 was realized. The Secretary of the Electricity Committee mentioned that there would have been a saving in cost of generation were it not for delay in the erection of new plant, due to the Dublin labour troubles, to which was also attributed the falling off of income of between £3000 and £4000.

The Finance Committee complain that there is not sufficient supervision exercised by the Electricity Committee to ensure that due relation shall be maintained between the receipts and expenditure on capital account. No provision could be made for the relief of rates in the coming year.

In a comment on the report, the "Irish Independent" says that since no relief is to be given to the ratepayers, who financed the electricity undertaking when it was making an annual loss, it would appear that "the ratepayers have to support this undertaking when it does not pay, but can get none of its profits when they are earned."

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The Provisional Order inquiry which has been held in Glasgow during the week, and which is reported in detail elsewhere, gives the Corporation power, in eight years' time, to levy a rate up to 6d. in the pound for the lighting of the streets and common stairs. This will be charged half to the proprietor and half to the tenant. The decision of the Commissioners may have considerable influence upon this question in other places as well as in Glasgow; and we may expect other authorities to ask for similar powers in the next omnibus Bill or Order they may promote. One remarkable fact was mentioned in the course of the evidence of Mr. S. B. Langlands, and referred to in the Solicitor-General's opening remarks—that about 90 per cent. of the population of Glasgow reach their residences by means of the common stair. This means that over 900,000 of its citizens are more or less herded together in huge buildings, which cannot give them the full amount of light and air which makes for health and happiness. As regards the lighting of these closes and common stairs, there is no doubt that where the need of good lighting is most felt will be found the worst examples of how not to do it. Here are to be seen the burners of the rat-tail order, only making darkness visible, when the finest light is required on account of good order, public safety, and public morals. The remark of Mr. Lindsay, the Glasgow Town Clerk, is worth printing in large capitals—"One lamp-post is worth an extra policeman any night." Now a lamp in Glasgow costs (say) 24s. to 25s. per annum; so that a policeman is certainly more expensive. Apart from the slight exaggeration in the remark, however, it carries with it the fact that light is the greatest enemy of wrongdoing. Glasgow it seems spends more money and has more lamps than any other city in Great Britain, if we except the City of London as representing the capital. Of course, if the County of London or the whole area of that vast city were taken, the number of lamps would be much larger, and the lighting bill much higher. No one will deny that the Corporation is the proper body to look after the lighting of the streets, whether public or private, and the stair lighting. The Chairman of the Commissioners, Sir John A. Dewar, said the only question was as to who was to pay, and what the amount of such payment was to be. Presumably it will in the end come out of the pockets of the householder, who will be charged it in his rent; but the decreasing value of house property makes it very difficult for a landlord to ask, and obtain, increased rents. This is where the shoe pinches, and the reason why property owners objected to the levying of a rate upon themselves, as well as the tenant.

The Lanarkshire Gas Order, which is to be inquired into while the Commissioners are still in Glasgow, is for granting powers to the County Council of Lanarkshire to take over the undertakings of gas companies within their area, without having to comply with all the terms of the Burghs Gas Supply (Scotland) Act of 1876, and amended by that of 1893. It is pointed out that the methods of election of a county council and a district committee are different from those of the town council of a burgh, and that a "special lighting district," in which the Acts quoted give special powers of acquiring the gas undertakings, may have boundaries not co-terminous with the area in which the undertaking is in fact supplying gas. The County Council therefore ask that powers be given them for a district committee by a majority of two-thirds present and voting to resolve and adopt the Act, after 21 days' notice by advertisement and otherwise. The resolution is then to be sent to the County Council for confirmation by a two-thirds majority, with, again, 21 days' notice. The confirmation is then notified in the "Edinburgh Gazette," and within 21 days any ratepayer in the special lighting district may appeal to the Sheriff, who may approve or alter the area of the district. If no appeal is made to the Sheriff, he shall authorize the registration, with such alteration as he has made, in the Sheriff Court Books of the County; and the Act, as amended, shall then be in force. The further clauses of the Order relate to the purchase of works and the carrying on of them, and further powers as to supply of gas and fittings.

The Gourock Town Council have again decided to erect a new gasholder. It is reported that this is to be of a somewhat smaller capacity than the one originally proposed some while back. The matter was only settled by a majority of 5 to 3 of the Councillors, and has to be confirmed or otherwise at the next monthly meeting. The site chosen is close to the present works.

A Mr. Cooper, an electrician, has been discoursing upon the figures, which the Peterhead Town Council issued as to the cost of electric light as compared with gas, and which he says are very far from being correct. He contends that electric light at 3d. per unit is equivalent to gas at 1s. 4d. to 1s. 6d. per 1000 cubic feet. He gives no figures in support of his statement, and suggests that it would be wise for anyone to test the thing for himself. Before he can really do this,

SUITABLE FOR ALL WATERS.

"Spiral Circulator," with Manhole Closed.

THE WILSON "SPIRAL-CIRCULATOR"

(Patent No. 28996.

ALL COPPER (Only Two Brazed Joints).
NO RUSTING : NO LEAKING.
ATTRACTIVE : COMPACT.
SIMPLY FIXED : OCCUPIES NO FLOOR SPACE.

Internally Heated. Perfect heat transfer; products travelling 5½ feet in heating chamber surrounded by water.

Cleaned Without Disconnection.
Flue—by lifting out Iron Spiral.
Water Chamber—Through Manhole.

Plan of Inverted Heater looking through flue with Spiral removed.

Iron Spiral which fits into the flue.

Full Descriptive Pamphlets and Prices from :

WILSONS & MATHIESONS, LTD.,
Carlton Works, ARMLEY, LEEDS.
London Show-Rooms: 76, Queen Street, Cheapside, E.C.

however, he must have electric light supplied in the town, which is probably all Mr. Cooper desires. Having installed the light and spent the money in fittings, &c., then the consumer may test it, and find, as he will do, that the estimate given by Mr. Cooper is about four times understated. The consumer can then discard the electric light and return to gas. He will by then have paid for his experience, and the electrician have received the money.

The opposition of the County to the proposed Provisional Order of the Kirkcaldy Corporation has been withdrawn; the Corporation having reduced the extra charge of 1s. per 1000 cubic feet, which they propose to charge in the out-districts which come under the county jurisdiction, to one of 10d. only.

The Wishaw Town Council have decided to have a valuation of their gas-works, plant, &c., which cost about £50,000. The indebtedness, however, is only some £20,000: so that it looks as if they had a valuable property, if the works have been kept up to the proper standard since they were taken over by the Council. The Auditor has several times raised the question of depreciation; and it is understood that the valuator selected is to include this question in his report. If a sufficient sum has been set aside each year for maintenance and renewals, then the property should be at least of its original value. This the valuator will have to decide. The amount of the sum for maintenance and renewals has been the bone of contention in all arbitrations between companies selling and town councils purchasing gas undertakings; and the figures given by the engineers representing the parties vary considerably. Probably some intermediate figure will be chosen which will allow sufficient for adequate replacement of any machinery which may wear out or become obsolete.

Big Fire at a Tar Distillery.

An explosion followed by a fire caused a very large amount of damage at Messrs. Hardman and Holden's chemical and tar works at Miles Platting on Sunday evening. The monetary loss is placed as high as £80,000; but fortunately personal injuries were confined to the burning of one workman about the face. The cause of the explosion, which occurred in the washing plant, is unknown; but it is surmised that a vat containing acid overflowed, and the contents on coming into contact with another substance exploded. The full strength of the Manchester Fire Brigade was quickly on the spot, together with some 200 constables; and every effort was made to restrict the area of the outbreak. Lead tanks containing sulphuric acid to the value of £10,000 were emptied as rapidly as possible into the sewers; but the fabric could not be saved. Special attention, too, was devoted to a tank containing benzol; and the efforts to keep this cool were fortunately successful. A light breeze from a favourable quarter saved a large part of the plant.

The Padstow Gas Company, Limited, was registered last Tuesday, with a capital of £3000 in £1 shares, and with offices at the Quay, Padstow, Cornwall.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

The prices for benzol, toluol, solvent naphtha, and crude carbolic acid remain as last reported. The value of pitch is from 37s. 6d. to 38s. net per ton. Creosote remains at 3⅜d. per gallon net in bulk. Pyridine bases are 8s. 3d. to 8s. 6d. per gallon in buyers' packages. Anthracene, 45-50 per cent., is 2d. per unit.

Twenty-five per cent. sulphate of ammonia is dull, with sellers at £12 per ton net and naked at works, and buyers at £11 15s.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 25s. 6d. to 29s. 6d. Pitch, east coast, 37s. to 37s. 3d.; west coast, Manchester, 36s. to 36s. 3d.; Liverpool, 36s. 6d. to 36s. 9d.; Clyde, 36s. 6d. to 37s. 6d. Benzol, 90 per cent., naked, North, 10¼d. to 10½d.; 50-90 per cent., naked, North, 10d. to 10¼d. Toluol, naked, North, 10½d. to 11d. Crude naphtha, in bulk, North, 4¾d. to 5¼d. Solvent naphtha, naked, North, 9¼d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9¼d. f.o.b. Creosote, in bulk, North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0⅜d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1¼d. to 1⅜d.; "B," nominally ¾d. per unit, packages included and delivered.

The price for tar last week should read 25s. 6d. to 29s. 6d.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *March* 28.

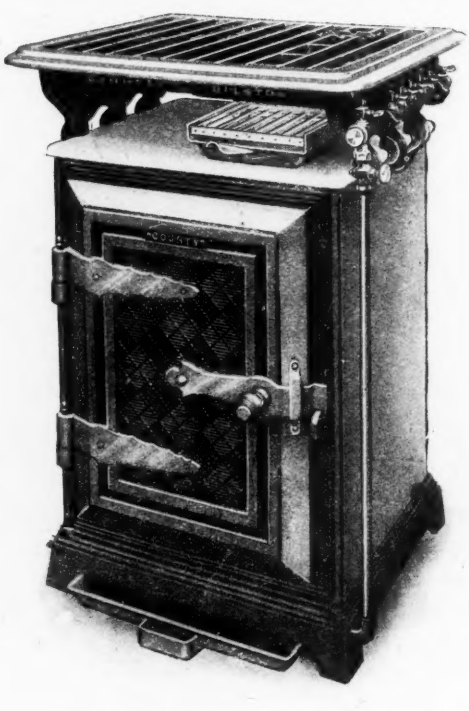
Throughout the week the market for this article has remained dull, and although values have not declined to any great extent, the tendency has been in a downward direction. The inquiry has practically all been for early shipment, and current supplies have proved ample to meet all requirements. The closing quotations are £12 5s. per ton f.o.b. Hull, £12 6s. 3d. per ton f.o.b. Liverpool, and £12 7s. 6d. per ton f.o.b. Leith. For future delivery buyers continue rather apathetic, but it is reported that business has been done by producers over the second half of this year on the basis of £12 3s. 9d. per ton f.o.b. the principal ports.

Nitrate of Soda.

The market for this material is somewhat easier, and the price has been reduced to 10s. 6d. per cwt. for ordinary, and 10s. 9d. for refined quality, on spot.

From another source, it is reported that the market for sulphate of ammonia has been quiet during the past few days, though prices have remained steady. Outside London, makes are quoted at £11 15s.; Hull, £12 7s. 6d.; Liverpool, £12 8s. 9d.; Leith, £12 10s.; Middlesbrough, £12 7s. 6d.

"CANNON" Gas Cookers



The "County"

Still maintains its POPULARITY, OWING TO ITS MANY ADVANTAGES.

Up-to-Date in Construction.

It is to your interest to have this COOKER ON YOUR HIRE LIST.

An Ideal Cooker for Hiring-Out Purposes.

Ask for a supply of our NEW SEASON'S BOOKLETS, Free on application.

CANNON IRON FOUNDRIES, LD.,

DEEPFIELDS, Nr. Bilston, Staffs.

London Office and Show-Rooms:—

18, HOLBORN VIADUCT, E.C.

Australasian Agents: MOLDEN & BUDDEN PTY., Ltd, 364A, Little Collins Street, Melbourne, Vic.; and at SYDNEY, N.S.W.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is steady, and the shipments are well maintained in general, though competition is keen in some classes. Steam coals are active, and more sales forward are being made. Best Northumbrians are from 13s. 6d. to 14s. per ton f.o.b.; and for second-class steams, from 11s. 6d. to 12s. per ton is quoted. Steam smalls are firmer, and vary from 6s. 6d. to 8s. 6d. per ton f.o.b., according to quality. There is a fair output, which is well taken up. The gas coal trade is active, with good deliveries, and many sales on contract. Best Durhams are from 13s. 3d. to 13s. 6d. per ton f.o.b. for prompt delivery; second-class gas coals from 12s. to 12s. 6d. per ton; and "Wear specials," from 13s. 6d. to 13s. 9d. In contracts, some 40,000 tons of Durham gas coal have been sold for Bremen at from 11s. to 11s. 3d. per ton f.o.b. Much progress has now been made with the contracts for the London Gas Companies; and the prices vary from 14s. 3d. to 14s. 10½d. per ton delivered. Freight has also been settled at 2s. 10½d. from the North to the Thames; so that at this rate the coal would be near 11s. to 12s. f.o.b.—the freight being much less than that of a year ago. It is expected that in a few days the bulk of these contracts will be settled; and the indication is that the price may be about 2s. per ton below the maximum attained last year. It is anticipated that other contracts will follow. Coke is steady. Gas coke is not quite so plentiful now; and the price is about 13s. 6d. per ton f.o.b. in the Tyne.

London Gas Coal Contracts.

It was, said "The Times" last Thursday, stated on the Newcastle Exchange the previous day that during the week two big London gas-works had contracted locally for over 1,000,000 tons of coal, or probably nearly one-third of the total quantity they required.

Growth of the Birmingham Gas Undertaking.—At the annual meeting of the Ladywood Ward Conservative Association last Thursday, Mr. A. W. Anster delivered an address on the municipal affairs of Birmingham. Few people, he said, understood the magnitude of the work of the Gas Department. Between 2000 and 2500 men were employed, and the annual wages bill was something like £190,000, together with a salaries account of £40,000. The steady growth of the undertaking was a matter for congratulation. In 1875 the price of gas was 3s. to 3s. 6d. per 1000 cubic feet; now it was 1s. to 1s. 11d. The profits in 1875 amounted to £25,000; to-day they were £80,000. The total amount contributed in relief of the rates during the past 38 years was more than £1,500,000. There were at present 190,000 consumers; and the copper coins taken from the penny-in-the-slot meters in one year weighed about 500 tons. The department was about to adopt a slot-meter which would enable consumers to have a shillingsworth of gas at a time.

Dublin Townships' Electric Lighting Scheme.

The Blackrock (Dublin) Urban District Council on Wednesday last resolved, in connection with the proposals for the electric lighting of Kingstown, Blackrock, and Dalkey, that a municipal scheme was the more favourable, and ordered that plans be prepared. Mr. C. J. Reddy, of Kingstown, has written to the Press that, whatever the course of events in reference to the Provisional Orders before Parliament for an electric supply for Kingstown, the Council will require to obtain a Statute of their own, and urging that the ratepayers should be saved the cost of acquiring an asset from a private company which would be of no use to Kingstown. He suggested that the three townships should confer, with the object of promoting a joint scheme. "If," he says, "we had a private company trying to control the electric lighting, they would have a right to charge up to 8d. per unit. If the Alliance and Dublin Consumers' Gas Company were to obtain the powers they seek, they would have the right to charge up to 7d. per unit. The Gas Company's charge is 3s. 4d. per 1000 cubic feet for gas, while in Belfast the charge is under 2s. per 1000 cubic feet." In Mr. Reddy's opinion, if the Kingstown Council got control of the lighting themselves there would be no reason why they should charge more than the amount payable by electric light consumers in Belfast, which in less than that charged in Dublin.

Fatal Accident with a Geyser.—Evidence at a Coroner's inquiry at Mansfield showed that Thomas Bryan (aged 18) went to have a bath, the water for which was heated by a geyser; and as he did not return the door was forced open, and he was found on the floor unconscious. There was a strong smell of gas; but both the gas and water taps were turned off. There was no ventilation in the room, and no flue to the geyser. It was stated by the doctor that death was due to poisoning by carbon monoxide. The Jury found that "Death was due to carbon monoxide poisoning, due to want of proper ventilation when using a geyser for the purpose of heating water for a bath;" and they also suggested that flues should be used with geysers.

Fatality at Stoke Newington.—A next-door neighbour was passing a house in Stoke Newington, he noticed a strong smell of escaping gas, and promptly informed the police. It was then ascertained that the occupants of the house had not been seen for a couple of days; and so a constable forced an entrance through a bedroom window. The house was full of gas; and in one of the rooms he found two women lying dead in bed. One of these was Miss Leese, aged 92; the other was her housekeeper, Miss West, aged 56. It was stated that the escape of gas had been caused by the failure of an old water-slide chandelier, the chain of which was broken. It was stated at the inquest that the chandelier had been in the house about forty years. The Coroner said he had received a letter from the Gas Light and Coke Company stating that they had issued notices warning householders against using such obsolete fittings. The Jury returned a verdict of "Accidental death."

Gas Plant and all constructional Steel and Iron Work.

Specialists in Slot Meters, Ordinary Meters, Wet & Dry.

WILLEY & CO., LTD., ENGINEERS,

EXETER, LONDON, MANCHESTER, LEICESTER.

The Pioneers of Slot Installations.

Gas Fires.

Gas Fittings.

Gas Cookers.

PICKERING'S VALVE. LIVESEY WASHERS.

Telegrams:
"WILLEY, EXETER."
"GASVILLADO, KINLAND, LONDON."
"METERS, LEICESTER."

Telephone Nos.:
132 EXETER.
224 DALSTON, LONDON.
4777 LEICESTER.

NOTE ADDRESSES.

Head Offices: EXETER.

London Works and Offices:
91-95, HERTFORD ROAD, KINGSLAND, N.

United States Import Duty on Incandescent Gas-Burners.

In the last number of the "Gas Age," of New York, reference is made to an appeal from a decision of the Board of General Appraisers assessing certain gas-burners for import duty at 45 per cent., under paragraph 199 of the Act of 1909, as "articles or wares not specially provided for in this section, composed wholly or in part of . . . steel." The burners were described in the opinion as "lamp parts made up of a tube-like covering of enamelled sheet metal, in which there are galvanized metal parts holding firmly within the covering a central brass tube, at one end of which is a device for regulating the air and gas supply to ensure perfect combustion of the gas when in use, and at the other end of which is a magnesia tip for holding the ordinary gas-mantle. The article has at one end a brass connection, so that it may be connected to a gas-pipe, while at the other end there are brass screws to hold a globe." It was claimed to be dutiable under paragraph 158 of the Act of 1909 providing for "table, kitchen, and hospital utensils, or other similar hollow ware of iron or steel," &c. The Court of Customs Appeals said that two things were to be noted—first, that the article before being susceptible of use must be fixed to a gas-pipe; second, it is not complete in itself, and forms no utensil or implement adapted to use. It lacks the gas-mantle, which is an essential requisite to its usefulness, and also lacks the globe which usually accompanies it, and for which provision is made. It is part of a fixed device not complete in itself, and which, when completed, would not be used as an implement or utensil in the ordinary sense in which these words are used, but would be more in the nature of a fixture or device. It was therefore held that there is no such resemblance to table, kitchen, or hospital utensils or hollow ware as to constitute it in a tariff sense similar to hollow ware of iron or steel; and the Board's decision was affirmed.

Northwich Water Bill.—The Northwich Urban District Council last Tuesday arrived at an agreement with the Middlewich Urban District Council by which Middlewich withdrew their opposition to the Northwich Water Bill, on the Northwich Council undertaking (on payment of pumping costs only) to make up any diminution in the Middlewich supply occasioned by the new works. A conference has also been held between the Northwich Council and Brunner, Mond, and Co., which is likely to lead to a settlement among all the parties.

Walsall Electrical Discussion Sequel.—The criticism which has been indulged in at Walsall, as the result of the serious losses sustained on the borough electricity undertaking during the past two years, promises to have a sequel in the Law Courts. At a recent meeting of the Walsall Tradesmen's Association, the subject was referred to by a number of speakers, one of whom (Mr. G. W. Warner, a member of the Town Council) has, it is stated, since had served him upon a writ issued at the instance of the Borough Electricity Engineer (Mr. A. S. Barnard), who alleges that certain statements made by Mr. Warner are of a libellous character.

C. & W. Walker, Limited.

Mr. J. F. Wright presided at the annual meeting of this Company last Thursday, when the Directors' report [*ante*, p. 769] was adopted. He said they were now engaged on a very large contract for the construction of a gasholder in Sydney. It was the largest gasholder ever erected in the British Empire. The total capacity would be 12,800,000 cubic feet, and it would be constructed of 4000 tons of steelwork. The floating vessel alone would consist of 1778 tons of steel. They would use 1,500,000 rivets, and if all the bars and plates were laid out end to end, they would cover a distance of 70 miles. There was a great improvement in the Company's profits. It was ten years since they had been able to put before the shareholders so good a result. They had had some years of what they had perhaps looked upon as rather bad business, but had been able to maintain a steady 10 per cent. dividend. The Board had decided to spend a considerable amount of money in remodelling the works and putting in the most modern labour-saving machinery that could be obtained. With this object in view, they proposed to offer the shareholders 10,000 new ordinary shares at a premium of 10s. each. The amount thus raised—£15,000—with what they might take from revenue, would enable them to carry out all the improvements and additions contemplated. At the same time it would leave their capital at the very small sum of £90,000. When they recollected they had during the past fifteen years utilized as capital surplus profits amounting to £59,000, which had gone in improvements and extensions, they would see what a good position the Company was in. The Directors had every confidence in recommending the further expenditure. They believed the savings that would be effected would enable them to take contracts that they would otherwise be unable to handle; and the extensions would at the same time considerably increase the profits. Last year the contracts were a record; being £75,000 more than the previous year. The prospects for this year were good.

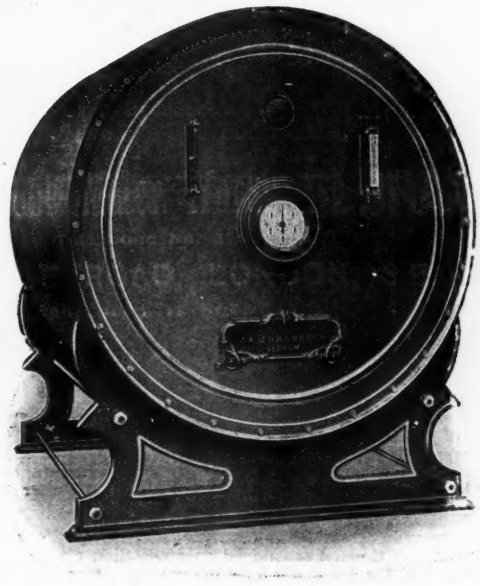
Failure of the Llanrwst Gas Supply.—Owingto a breakdown of the machinery at the gas-works, the town of Llanrwst was for some days without a gas supply.

Water-Works' Footpaths and Rights of Way.—The activities of local authorities were commented upon at a meeting of the Peak District and Northern Counties' Footpaths Preservation Association held at Manchester last Wednesday, when it was strongly urged that a "strict watch" should be kept over water-works schemes particularly. This, it was stated in the annual report, was emphasized "by the attempt of the Bolton Corporation to close many paths in the Darwen district." Colonel H. T. Crook, who presided, said he thought the members of the Committee were alive to the danger of Bills promoted by great public authorities for water-works. When a local authority were promoting a Bill in Parliament, they often seemed to try to secure the whole gathering-ground of the reservoir free from all public rights of way.

BRADDOCK'S IMPROVED GAS METERS

SECOND TO NONE.

Made in all Sizes.



No. 219. Braddock's Large Dry Meter.

No. 245. Braddock's Large Wet Meter.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, **OLDHAM,**

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.

Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

Trading in Apparatus at Bradford.

On Friday morning, a deputation of plumbers and others waited upon the Bradford Gas Committee to protest against the supposed intention of the Corporation to sell apparatus in competition with the plumbers and gas-fitters. It was contended that the extension of the establishment in Darley Street was so large that it could not possibly be made to pay on the ordinary trade basis, and that if it could be made to pay it would not be fair to the trading interests concerned that it should be so. Mr. Barraclough (the Chairman of the Gas Committee), in reply to the deputation, stated that practically no selling of apparatus had been done in the old show-room in Rawson Place, and it was not desired by the Corporation to go any further in the new premises than they had done in the old. They intended the new place to be for the display of apparatus only. Plumbers' merchants and plumbers could send their apparatus marked with their names and prices of the goods. The things would then be displayed, and if sold from the Corporation premises the money would be handed over to the owner. The plumbers' representatives expressed their satisfaction with the assurance given; and it may be taken for granted that there will be no further trouble now with a matter which was causing some difficulty to the Corporation.

Sale of Shares.—At a sale of shares at the Savile Arms Hotel, Elland, last week, £120 of 5 per cent. standard converted ordinary stock in the Elland-cum-Greetland Gas Company was sold at £120 per cent.; and £30 of 4 per cent. consolidated preference stock in the same Company was disposed of at £101 per cent.

Budleigh Salterton's Prosperous Gas-Works—A dividend of 5 per cent. was declared by the Budleigh Salterton Gas Company at their annual meeting last Wednesday; and the Chairman (Mr. A. R. S. Perkins) was able to congratulate the shareholders on what he remarked was an advance all round. He said the Directors had seen their way for the first time for many years to pay 5 per cent. on the whole of the ordinary shares. Arrangements had been made with Messrs. Willey and Co. for the erection of a new holder, which would greatly improve the supply; and he hoped the time was not distant when they would be able to reduce the price of gas.

Wandsworth Borough Council and the Brentford Gas Bill.—The Wandsworth Borough Council have considered the amendments made by the Committee of the House of Lords in the Brentford Gas Bill, and they are in accord with the new clauses which have been inserted in the Bill. The alterations and additions, which were indicated in our "Parliamentary Intelligence" last week, practically meet all the Council's views with regard to the Bill, with the exception that provisions for testing the calorific and illuminating power of the gas have not yet been agreed upon. The Council are willing to have inserted in the Bill such provisions in this respect as Parliament may impose in the Bill of the Gas Light and Coke Company.

Londonderry Gas Company.—In moving the adoption of the report at the meeting of the Company on Friday, Mr. H. J. Cooke reminded the shareholders that at the previous meeting some misgivings were entertained as to whether, owing to the threatened large advance in coal, and the fact that there was no corresponding advance in the price of gas, the dividend would be maintained at the previous level. Fortunately, their deficit had been made good in a most satisfactory manner. They had had a record increase of 6 million cubic feet in the gas consumption, and excellent results had also been obtained from residuals. The usual dividends were declared, of 10 per cent. on the old shares and 7 per cent. on the new.

Macclesfield Water-Works Loan.—Early in the present year an inquiry was held, on behalf of the Local Government Board, into an application by the Macclesfield Corporation for a loan of £14,100 for the purchase of land for the erection of new filtration plant, laying a main, &c. The reply of the Board has now been received. While not consenting to the application, the Board do not, it is understood, definitely refuse the loan. They want to be assured that the water supply of the borough is equal to all emergencies; and until they are satisfied that all the available sources of supply are secured, they withhold consent to the present scheme. It is thought that additional storage accommodation is what the Board are aiming at, in view of the shortage last autumn.

Advertising Electricity at the Seaside.—In a large number of Lancashire newspapers during the past week full-page advertisements have been issued drawing attention to the "advantages" of heating and cooking by electricity. This is, of course, the time of the year for bringing before consumers—and there are thousands of new boarding-house keepers who start business in Lancashire and Yorkshire every year—the immense advantages of the use of gas. Ere Easter sets in, most of the new comers, as well as the existing boarding-house proprietors, have fairly definite notions as to what type of cooking apparatus to instal for the approaching season; but, on the other hand, there are many who do not prepare until immediately after the holidays to "set their house in order."

Improved Street Lighting in Lambeth.—In May, 1911, the Lambeth Borough Council sanctioned an application made by the South Metropolitan Gas Company for permission to alter 33 existing private lamps in the Brixton Road to the Company's high-pressure system; the lamps to be kept alight during business hours at the expense of the various private owners of the premises. Twelve months later it was found that only 25 of the lamps had been erected; and on the attention of the Company being called to the matter, they stated that they had been unable to carry out the installation completely, as eight of the shopkeepers had decided not to undertake the cost of lighting until the autumn. At the request of the Company, matters were allowed to remain in abeyance. Later they informed the Council that they were quite prepared to carry out their agreement to alter the rest of the shop lamps in the Brixton Road. There are, however, five lamps maintained by the Council which, in their present condition, break up the appearance of the row; and the Council have made arrangements with the Company to remove them, and replace them with high-pressure lamps.

YOUR

ATTENTION

IS DIRECTED TO

THE POSITIVE PREPAYMENT METER

FIRST 1889. FOREMOST 1914.

MADE BY

SAWER & PURVES

THE PEOPLE WITH EXPERIENCE.

MILES PLATTING, MANCHESTER & RADFORD ROAD, NOTTINGHAM.

A dividend of 4½ per cent. (less income-tax) for the half year to Dec. 31 last is recommended by the Directors of the Imperial Continental Gas Association.

An interim dividend at the rate of 6 per cent. per annum has been declared by the Board of the Bland Light Syndicate, Limited, for the six months ended Oct. 31 last.

Messrs. J. E. & S. Spencer now have their office address at No. 16, Dowgate Hill, Cannon Street, E.C., and their warehouse at No. 33 in the same thoroughfare.

The London Show-Rooms of Messrs. John Harper and Co., Limited, of Willenhall, will in future be at Nos. 45-49, Holborn Viaduct, E.C. Mr. John H. Miller continues as their representative.

A new water scheme, estimated to cost £15,000, for the supply of the Atherstone rural district, is being prepared. Mr. H. Lapworth, D.Sc., M.Inst.C.E., of Westminster, has been appointed Consulting Engineer, to act with Mr. H. J. Coleby, the Engineer and Surveyor to the district, in the preparation of the scheme for the Local Government Board, and in carrying out the works.

Messrs J. & W. B. Smith, of Farringdon Road, have forwarded an illustrated sheet showing their latest types of inverted burners, and also a copy of a circular-letter which they are sending out to the trade, setting forth that, owing to the continued advance which has taken place in the prices of the raw materials and ingredients used in the manufacture of mantles, it is found necessary to charge an advance of 2s. per gross on the net prices of all mantles quoted in their price lists.

At the annual meeting of the Tickhill Gas Company a dividend of 5 per cent. on all shares was declared. It was reported that the consumption of gas was increasing, and that it would be necessary to take steps to enlarge the plant and provide a new gasholder.

The Coggeshall (Essex) Gas-Works, one of the very oldest in the county, have recently been acquired by the Kelvedon Gas Company. The works will be shut down, and gas be supplied from Kelvedon, about three miles distant. Compressors of the Bryan-Donkin type have been installed, and Messrs. A. H. Ball and Co., of Farnham, have just laid a high-pressure Mannesmann steel main between the two places. The same firm are carrying out main-laying extensions at Herne Bay and Fenny Stratford—the British Mannesmann's Company's tubes being used. The Farnham firm are also laying a new 30-inch cast-iron trunk main for the Eastbourne Gas Company.

On the *agenda* for the annual meeting of the National Chamber of Trade, which is to be held at Blackpool on the 20th prox., the following resolution appears: That this chamber is strongly of opinion that some reasonable legislative restriction should be placed upon the present unlimited amount of the highly poisonous gas, carbon monoxide, which may be present in the mixture of carburetted water gas and coal gas now being supplied by many gas manufacturers for lighting, heating, and cooking purposes in houses and shops, and requests the Government, in the interests of public health, to seriously consider the desirability of adopting the restrictions and safeguards arranged in the report of the Departmental Committee on the manufacture and use of gas containing a large proportion of carbon monoxide (1899)."

GAS COMPANIES IN THE STOCK EXCHANGE.

Last week was an historic epoch for the country; but the public agitation was not reflected in the Stock Exchange. Aided by the progressively favourable monetary outlook, markets were extremely cheerful in the earlier portion of the week, and prices rose freely. And later, when the momentous revelations of the Government's plan—or perhaps one should say the dominating section of the Cabinet's plan—of campaign against Ulster was laid bare, the critical state of affairs so staggered speculation that the paralyzed markets were almost incapable of making any movement. Prices in general were moderately put down, and there they stayed; so that the gains in the beginning of the week were not wholly lost at the end. Monday opened full of confidence that home troubles really promised to be more soluble, and foreign affairs were regarded with more calm. Prices were raised to meet a demand which was realized. All departments were strong. Consols rose ¼, and other gilt-edged advanced. Rails were in good case, Transatlantics were strongly supported, and Foreign were firmer. On Tuesday, this cheerfulness was well maintained on the strength of the Premier's statements, and markets in general pursued their path of progress. Consols gained another ¼. On Wednesday, the fair breeze fell, and the wind was in a stormy quarter. Public affairs were too bewildering. So much as was known was alarming—probably the unknown was more alarming. All markets were much depressed, and Consols fell ¼. Thursday was highly nervous at the unprecedented situation. Markets were held in gloomy inaction. Prices had been put down in expectation of trouble, and the day's business was not sufficient to lift them. Consols did not move. On Friday, business was almost arrested; all awaiting the unravelling of the tremendous knot in which the Government had entangled themselves. Prices were down but a little; business being insufficient to work much of a move either way. Consols were still unchanged. On Saturday, business was at an *impasse;* the attendance being very small. The general attitude was marking time in patient expectation of developments. Consols closed at 75¼ to 75¾—a rise of ⅛ in the week. In the Money Market, there was a good demand for Stock Exchange and general quarter-end requirements Discount rates eased considerably. Business in the Gas Market showed a very poor aggregate of transactions, participating in the general set-back to activity suffered in other departments. Excluding the two largest issues, all the rest did not provide enough for one day's fair work. But the tone was quite firm. In Gas Light and Coke issues, the ordinary was lightly operated in at the old prices; all figures being within the limits of 101 and 101¾. In the secured issues, the preference was done at 96½ and 97½, and the debenture at 75. South Metropolitan changed hands at 109½ to 111. In Commercials, the 4 per cent. was done at 107 and 107½. Among the Suburban and Provincial group, Alliance and Dublin realized from 57 to 60¼ (a rise of 1), British 45¼ to 45⅝ *cum div.*, Ilford 149, South Suburban 115, ditto debenture 113½ and 114½, and (on the local Exchanges) Liverpool "B" 143½, and Newcastle 100. In the Continental companies, Imperial marked 173 to 174½, Union preference 121, and European 17¾ and 18½. Among the undertakings of the remoter world, Cape Town preference made 2⅝, Primitiva 6⅜, ditto preference 5 and 5⅛, and San Paulo debenture 49.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 75¼—75¾. Previous week, 74¾—75¼.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	2½†	Alliance & Dublin Ord.	56–61	+1	4 2 0	75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅞	..	6 3 1
374,000	"	Jan. 15	4	Do. 4 p.c. Deb.	73–81	..	4 12 9	250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5								
50,000	10	Feb. 16	16	Bourne-mouth Gas & Water 10 p.c. Pref. 6 p.c.	27⅞–28⅞	..	5 11 4	541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅜–12½	..	6 10 8
352,500	10		7		14½–15	..	4 13 4	1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'teah'd Con.	99⅞–100	–¼	4 10 0
75,000	10	"	6		13½–14	..	4 5 9	529,705	Stk.	Dec. 30	8½	Do. 3½ p.c. Deb.	83½–84½	..	4 2 10
380,000	Stk.	Feb. 26	14	Brentford Consolidated	256–261	..	5 7 3	55,940	10	Feb. 26	7/14.0	North Middlesex 7 p.c.	12⅞–13⅛	..	5 14 1
330,000	"	"	11	Do. New	202–207	..	5 6 3	300 000	Stk.	Nov. 27	8	Oriental, Ltd.	120–125	..	6 8 0
50,000	"	"	5	Do. 5 p.c. Pref.	109–111	..	4 10 1	60,000	5	Mar. 26	10	Ottoman, Ltd.	7–7⅛*	..	6 13 4
206,250	"	Dec. 11	4	Do. 4 p.c. Deb.	93–95	..	4 4 3	60,000	50	Feb. 26	13	Portsea, Island B	127–130	..	5 0 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	196–201	..	5 9 5	100,000	50	"	12	Do. C	118–121	..	4 19 2
244,200	"	"	8	Do. A Ord. Stk.	145–148	..	5 8 1	249,980	5	Oct. 15	8	Primitiva Ord.	6⅜–6¼	..	5 16 5
530,000	20	Mar. 26	12½	British	44–45*	..	5 11 1	499,960	5	Dec. 30	5	" 5 p.c. Pref.	5–5¼	..	4 15 3
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	90–92	..	4 7 0	521,600	100	Dec. 1	4	" 4 p.c. Deb.	93–95	..	4 4 3
245,771	Stk.		4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11	346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
100,000	10	"	—	Cape Town & Dis., Ltd.	1–2	..	—	275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2¼–4¼	..	—	150,000	10	"	6	Do. 6 p.c. Pref.	10¼–11⅜	..	5 5 6
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73–78	..	5 15 5	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	106¾–107½	..	4 12 2	135,000	Stk.	Mar. 12	10	Sheffield A	221–223	..	4 9 8
1,513,280	Stk.	Feb. 12	6/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2	209,984	"	"	10	Do. B	221–223	..	4 9 8
560,000	"	"	5½	Do. 3½ p.c. do.	103½–105½	..	5 1 1	523,500	"	"	10	Do. C	220–222	..	4 10 1
475,000	"	Dec. 11	3	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2	90,000	10	Oct. 15	7½	South African	10½–11⅜	..	6 10 5
800,000	Stk.	"	4½	Continental Union, Ltd.	80–83	..	5 8 5	6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	109½–111½	..	4 18 0
200,000	"	"	7	Do. 7 p.c. Pref.	117–122	..	5 14 9	1,895,445	"	Jan. 15	3	Do. 3 p.c. Deb.	73–75	..	4 0 0
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0	209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	155–157	..	5 8 3
55,000	"	—	4	Do. Deb. Stk.	102–104	..	3 16 11	952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 0
1,002,180	10	Jan. 15	10	European, Ltd.	17½–18½	..	5 8 1	60,000	"	"	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
16,386,660	Stk.	Feb. 12	4/17/4	Gas-light and Coke 4 p.c. Ord.	101–102	..	4 15 6	117,053	"	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
2,600,000	"	"	3½	3½ p.c. max.	75–79	..	4 8 7	594,740	Stk.	Nov. 13	5	Southampton Ord.	101–104	..	4 16 2
4,062,235	"	"	4	4 p.c. Con. Pref.	95–98	..	4 1 8	120,000	Stk.	Feb 12	7⅜	Tottenham District A 5 p.c.	135–138	..	5 6 10
4,674,850	"	Dec. 11	3	3 p.c. Con. Deb.	73–75	..	4 0 0	543,940	"	"	5⅛	B 3½ p.c.	114–116	..	5 1 3
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4	149,470	"	Dec. 30	4	4 p.c. Deb.	89–91	..	4 7 11
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅜–17½	..	6 7 6	182,380	10	"	5	Tuscan, Ltd.	5–6	..	8 6 8
131,000	Stk.	Mar. 12	7⅜	Ilford A and C	147–150	..	5 1 8	149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
65,780	"	"	6⅜	Do. B	115–118	..	5 3 10	236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–110½	..	4 10 6
65,500	"	Dec. 30	4	Do. 4 p.c. Deb.	89–91	..	4 7 11					Wandsworth, Wimbledon, and Epsom—			
4,940,000	Stk.	Nov. 13	9	Imperial Continental	172–177	..	5 1 8								
1,235,000	Stk.	Feb. 12	8⅜	Do. 8⅜ p.c. Deb. Red.	83½–85½	..	4 1 10	30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
200,242	Stk.	Mar. 12	6⅜	Lea Bridge Ord. 5 p.c.	118–120	+2½	5 8 4	255,636	"	"	6⅜	" B 3½ p.c.	129–134	..	5 2 7
561,000	Stk.	Feb. 26	10	Liverpool United A	209–211	..	4 14 9	108,075	"	"	5/17/3	" C 3½ p.c.	110–115	..	5 2 0
718,100	"	"	7	Do. B	142–144	..	4 17 3	352,000	"	"	6⅜	Wimbledon 5 p.c.	112–117	+4	5 4 8
306,083	"	Dec. 30	4	Do. Deb. Stk.	99–101	..	3 19 3	98,000	"	"	6⅜	Epsom 5 p.c.	116–121	+4	5 9 6
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7	88,416	"	Dec. 30	3	3 p.c. Deb. Stk.	71–73	..	4 2 2

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

SALESMAN AND CANVASSER (RESIDUALS). No. 5856.
MANAGER (TAR DISTILLING PLANT). "Tar," c/o Deacon's, Leadenhall Street, E.C.

Appointments, &c., Wanted.

LEADBURNER, &c. No. 5862.

Gas-Works Wanted.

"D. G.," c/o SCRIPPS'S Advertising Offices, 13, South Molton Street, W.

Plant, &c. (Second-Hand), for Sale.

PURIFIERS, &c. Brighouse Gas-Works.
RETORTS. Newcastle Gas Company.

Sales of Stocks and Shares.

CROMER GAS COMPANY. No. 5864.
SEVENOAKS GAS COMPANY. London Mart. April 21.
SEVENOAKS WATER COMPANY. By Tender. April 25.
SOUTHEND WATER COMPANY. London Mart. April 21.
WATFORD GAS AND COKE COMPANY. London Mart. April 21.

TENDERS FOR

Coal.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY. Tenders by April 8.
WANDSWORTH WIMBLEDON AND EPSOM GAS COMPANY. Tenders by April 15.

Coke Oven Plant, &c.

MALMO (SWEDEN) MUNICIPAL GAS-WORKS. Tenders by April 30.

Tar.

LIMERICK GAS DEPARTMENT. Tenders by April 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: 6857 Holborn.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.

RETORT SETTINGS, COAL TESTING PLANT, BOILER FIRING.

Communications should be addressed to UNDERWOOD HOUSE, PAISLEY.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD. 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, FEN. LONDON."
Telephone: 1588 AVENUE (3 lines).

POULTONS & TIMMIS, Ltd.

CARBONIZING and Boiler Setting Engineers, Complete Installations undertaken. Their Retort Settings are THE best.
GUARANTEED RESULTS.
Registered Office: READING. Telephone: 265 Reading.
London Office: 53, VICTORIA STREET, S.W.
Telephone: 3512 VICTORIA.
Manchester Office: 55, CROSS STREET.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.
For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.
SALISBURY HOUSE, LONDON WALL, E.C.
Telephones: 4452 and 4453 London Wall.
Telegraphic Address: "Carburine, London."

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 10, p. 294.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

TAR WANTED.
Telephone 5 Brownhills. Established 1840.
Best Prices Paid.
BROWNHILLS CHEMICAL WORKS COMPANY,
BROWNHILLS, NEAR WALSALL, STAFFS.

IT'S IN THE JOINTING.
High Pressure Mains must be absolutely TIGHT.
WE GUARANTEE OUR WORK.
Lead Wool, Oxy-Acetylene Welded, or Ordinary Jointing.
COMPLETE HIGH PRESSURE SCHEMES.
Enquiries Solicited.
A. H. BALL & Co., LTD., FARNHAM, SURREY.
Telegrams: "Sappers Farnham." Telephone 85.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF." THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

FIDDES-ALDRIDGE.
SIMULTANEOUS DISCHARGING-CHARGER.
The One Machine which Discharges and Charges at One Stroke.
See Advertisement, March. 10, p. III.
ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "Motorpathy London." Telephone: 5118 Victoria.

TAR Wanted.
FREDK. G. HOLMES AND Co., Tar Distillers, Thames Tar Works, NORTHFLEET.

PATENTS AND TRADE MARKS
PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.